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The consolidation of Electrical World, Electrical Engineer and American Electrician

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THE record of the light and power industry is in the field. It is built upon the services it has rendered in the local territories. It lies in the facts available in the service areas.

Service accomplishments of the light and power industry have been surveyed by the editorial staff of *Electrical World*. Trends, statistical data, policy developments and commercial progress as a result of field surveys are included in this issue.

In addition, executives of the light and power industry comment on current industry problems. H. T. Sands, Guy W. Talbot, Franklin T. Griffith, T. O. Kennedy, Walter S. Wyman, Charles L. Edgar, P. S. Arkwright, A. F. Hockenbeamer, Frank L. Dame, P. G. Gossler, Don M. Sterns, Owen D. Young and Joseph F. Porter give insight into utility executive policy.

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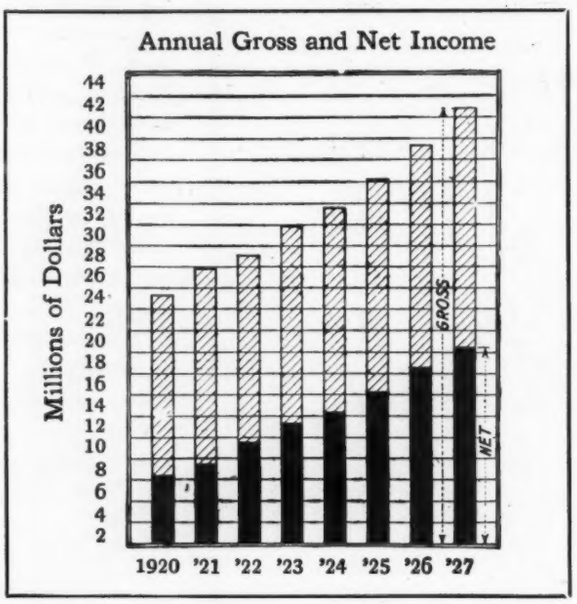

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Editor

VOLUME 91 — *New York, Saturday, May 26, 1928* — NUMBER 21

Stock Taking at Atlantic City Will Show No Cause for Alarm

THE Atlantic City convention of the National Electric Light Association will be held under auspicious circumstances. Gratifying progress has been made by member companies of the organization, which means almost the entire electric light and power industry, and the only cloud discoverable in an otherwise clear sky is the investigation of the Federal Trade Commission. That, of course, involves only a small percentage of the membership of the N.E.L.A.; nevertheless, it will be difficult to get the public to believe that any policy of the few does not apply to all. The investigation is a challenge to the industry to enlarge and improve its public relations. What is being doled out by the sensational press makes its appeal to the heart, and if the heart governs the head, it is because not enough effort has been made to instruct the head.

Aside from the diversion which Congress and the Federal Trade Commission offer, the economic evolution of the business goes steadily on. Consolidations and mergers still occupy the attention of executives and bankers although playing havoc at times with operating organizations. It is inevitable that in the changes brought about in the interest of economy and better service some temporary maladjustments will occur; but so long as any human need or desire remains unsatisfied—and there is great demand for electricity—none in the industry need be without employment. Mergers are not to be feared. They are in keeping with the economic trend of the times. Properly conceived and executed, they make for stability, standardization of equipment and operating practices, simplicity of financial structure, greater opportunity for decentralized management with centralized credit and control, and cheaper and better service to the public.

Technically, the electric light and power companies, thanks to their array of outstanding engineers, have always made an excellent showing. If in anything they have not measured up to possibilities, it has been in commercial exploitation of their product. However, here, too, progress is beginning to be evident. Companies are adopting aggressive and balanced policies whereby new business is being sought and no longer waited for. Salesmen are out after new factories for their territory; surveys of resources are being made with a view of selling the region to national industrial groups; commercial and street lighting are being developed, and domestic load is taking on a new meaning. Only through the development of all classes of business is it possible to do pioneering in new business without jeopardy to the balance sheet, and it is gratifying to note that the electric light and power companies of the country, under the leadership of the national association, are beginning to visualize the opportunities of the business and to realize them commercially. Thus the industry bids fair to continue on its uninterrupted march of progress with satisfaction to itself and the public it serves.

* * * *

An Unfinished Industry

DESPITE the epic proportions of the light and power industry it is unfinished. It has not yet attained the standards which all desire and which can be brought about. It will always be an unfinished industry, for the end of electrical developments is not even remotely visible and there is no boundary to the opportunities for service presented by the future. In this fact lies the inspiration for builders of the industry. The streams of electricity have entered into sixteen million American homes to afford light, to iron, to cook, to clean and to entertain. They have entered into cities and factories to give brain power unlimited possibilities to replace muscle power. They have flowed across natural resources and changed them into useful products for civilized man. It seems as if a modern Aladdin had indeed rubbed a lamp and sent warmth, light and energy into the world.

Our standards of living and comfort have risen through the progress of scientific research, discovery and invention and through our joyous application of every new development. New electrical devices fitted with the social instincts of our people and became the tools which helped to build national prosperity and comfort. In contrast as they are with past civilizations, our present standards are matters for country-wide gratitude to those who have guided electrical developments. They were men of large initiative and greater courage. But public gratitude must be earned through public understanding, and public understanding of the electrical industry does not exist in the degree necessary to enable it to do its best work.

The industry has grown too rapidly, it has expanded its services too greatly, it has invested money too heavily, and it has become too technical. In these respects it is far in advance of public understanding, and in this fact lies reason for serious thought. Those in the industry know that public good has been the inspiration for electrical developments. They know the joy which industry builders have experienced in developing every possibility for public service. They know that exploitation and enormous earnings have never characterized light and power enterprises. But people in general have

not grasped utility values or utility ideals. They are apt to respond to demagogic appeals and to distrust corporations because of past experiences with large industries and because of innate prejudices against something big and not easily understandable.

These are matters which deserve the undivided attention of leaders of American thought. The initiative is with the electrical industry, but the responsibility is shared by all thoughtful leaders of industry in general. A growing and prosperous light and power industry is the greatest asset for maintaining and expanding nation-wide standards of wellbeing. Whatever electricity has accomplished in the past is nothing when measured in terms of future possibilities. Builders of the industry have money, initiative and brains, but to use these tools to the best advantage they need public understanding as well. They and the public must belong to the same union and have, in addition, no jurisdictional fights. How to bring about this desired condition is the big problem confronting the light and power industry today.

* * * *

Tools for Doing the Job

THE task of the electric light and power industry never changes and is never ended. Today as yesterday it is to provide good electric service at a fair price. It is to keep abreast of and apply technical progress in the art. It is to expand existing services and provide new services by acting upon all opportunities to bring savings and comforts into American homes and industries. It is to co-operate in all local, state and national activities which are worthy. It is to become a friend to its customers and remain one. It is to get public approval and understanding of its activities and policies. For the most part the light and power industry has succeeded in this work. Only in its attempts to get public understanding does there appear to be any degree of failure and a touch of the amateur. Human traits have not always been measured or appealed to intelligently.

A first reaction to the political hubbub at Washington is that the usual "public relations" practices should be discarded, forgotten and thrown away; that they have lost their vital significance and have become merely a departmentalized activity; that they strike false notes when they take the form of alleged propagandic pamphlets and books, of press releases which glorify and addresses which degenerate into self-eulogy, of professed altruism unsupported by acts, and even possibly now and then of political actions which call back to mind the railroad lobbyists of other days.

None the less, the tools used in the past to get public understanding are good tools if used properly. They should not be discarded. They should be sharpened and used more intelligently. The public utility information bureaus have done splendid work in making news available; books and pamphlets have been printed which are of great educational value; the light and power industry has leaders whose recorded addresses strike a very high note in announcements of policy and in contributions to American thought. The industry has a remarkably clean political record and has been noteworthy for its contributions to causes which sought to improve national welfare. Only in minor instances have the usual tools of the "public relations" department been used by clumsy hands. The point is, however, that these tools in themselves are unable to create public understanding and good will when wielded by a department only and when used in the customary manner. They must be supplemented by other tools.

Public relations must be part of the work of every utility man in all of his activities. An attractive-looking substation, a street without fairy draperies of poles and wires, a neatly uniformed employee, a truck driver who respects the rights of other motorists, a salesman who knows when to take "no" for an answer, a smiling employee at the complaint window, an executive group who are citizens, chamber of commerce men, clubmen and community builders because they like to be part of the community activities—these things gain and keep the confidence, sympathy and understanding of the community served. Utility advertising that supports community projects or that tells of actual contributions to community growth in a modest manner, utility show windows that tell the story of electric service in terms of tangible comforts made possible by appliances and set a pattern of style in display which other merchants desire to use, news releases which are free from bias and have human interest, addresses and talks to community groups about electricity and the local developments, commercial policies which bring co-operation instead of competition and, above all else, good service—all these tools are good and should be used intelligently by every utility.

Utility companies have no reason to be ashamed. There is no ignominy in fine service and no closet skeleton in their history. They are made up of people and are no more godlike than the people they serve, but there is an old proverb, "The servant of a king is a king."

* * * *

Engineers as Managers

UTILITY engineers during the past year have been taking stock of their function in the light and power business. The result has been the development of some good plans and objectives. There is general agreement that engineers have a "dollar" responsibility in building systems and in addition that co-ordinated plans should replace current expedience in the development of a light and power property.

The assembly of an enormous amount of technical equipment is necessary in a modern plant. This equipment must operate to give service and, in this operation, must be controlled by engineers. In both assembly and operation the major function of the engineer, in the mind of the executive, is to get economic results. His technical competency is granted, but his business judgment has been challenged frequently. It is encouraging to note, therefore, that the engineer has come to realize his economic function, but he should go further and recognize his management function also, thereby introducing some human engineering into his technical plans and operations.

None is better equipped to manage utility properties than the engineer if he will add an understanding of men and an economic sense of values to his engineering qualifications. In a technical industry he has an asset which gives him the advantage over a lay competitor for executive position, but in the past the technical man has done very little to earn the executive standing for which he can qualify. He should plan economic systems and also manage them. The hired managers of the utility industry will be engineers, if the engineers will take the trouble to qualify for the posts.

Inducement Rates and Customer Revenue

WHEREVER light and power companies have introduced inducement rates that enable domestic customers to use additional energy at low unit cost and have backed up these rates with vigorous sales effort they have raised considerably the average consumption per customer. Pittsburgh, without much electric range load, claims an average domestic consumption of 637 kilowatt-hours. Buffalo reports 743 kilowatt-hours. Out in the Northwest, with water heating added to range load, the average for most of the companies has gone away above these Eastern figures, and it reached 1,676 kilowatt-hours in the case of the Washington Water Power Company. Six Rocky Mountain and Pacific Coast companies averaged 502 kilowatt-hours.

Notwithstanding all these cases of high average consumption per domestic customer, however, the average annual domestic revenue ranges only from $25 to $33. As contributors to the general public in the form of more service for the same or little additional expenditure these companies have achieved results; but so far as regards making domestic customers more profitable not much progress has been made. Does this mean that the inducement rates are lower than necessary to attract business? Does it mean that the public sets a definite budget for electric service and will not spend any more? Or does it mean that enough additional household uses for electricity have not been found?

In any event the situation affords something to think about and act upon. Domestic customers individually and collectively have brought a notoriously low return for the investment to serve them, the cost of handling their accounts and the cost of maintaining service reliability. Certainly, the inducement-rate idea is not wrong—but added consumption should be profitable consumption.

* * * *

Mergers and Dividends Deserve Interpretation

AN OPPORTUNITY exists for getting better public understanding of the larger business aspects of the public utility business. News of big mergers of operating and holding utilities or of stock dividend disbursements should include more than the bare financial details that are apt to suggest an atmosphere of "melon cutting" to the newspaper-reading public. There are tangible financial, operating and service reasons for mergers. All intelligent utility executives build their business on the basis of better public service as a fundamental, and they make business decisions as to mergers or dividends only after striking favorable balances in terms of benefits to the public as well as themselves.

The public has a right to know these reasons and needs them to understand the business moves. Private enterprise operates the majority of utilities in this country because it gives good service at a fair price. It acts as a hired executive, its books are open to public inspection, and there are many inducements that should lead utility executives to interpret their business transactions to the public they serve. Such a practice would prove good policy and good business, for it would gain the confidence of the public and thus help to police the industry. If the practice were universal, the exploiter and stock jobber would have no opportunity to exist because no legitimate reasons could be advanced for contemplated purchases or financing. The interpreted balance sheet so widely used by operating properties should be supplemented by a similar interpreted presentation of the tangible reasons for specific mergers and announcements of stock dividends or other operations of holding companies.

* * * *

Engineering Brains Needed for Building Business

AN ANALYTICAL approach to the utility business calls for the type of training and approach typical of the engineer. The engineer has been very successful in the construction and operation of the physical facilities of the industry because he has planned his work in advance of installation and operation. Now the power industry is waiting with a new job for the engineer and it is of pressing importance. His orderly thinking is needed in the building of the market and in the commercial planning of utility expansion. For central-station selling has followed too long the easy policy of expediency and opportunism. The time has come when to the development of load should be given the same intelligent analysis and balanced effort that goes into the projecting and the designing and the progressive growth of a great transmission system. The same regard for the economics of the present and the future is called for both in the engineering and in the market-building enterprise.

All this would have been recognized long since had it not been for the fortunate popularity of electric service through the years. For a long time no selling was needed. Then it was but natural to seek the business easiest to secure. And the absence of commercial competition has ever been conducive to complacency. But now comes the commercial era. Systems will no longer grow by the simple accumulation of customers. New load must be developed in the years ahead by intensive selling—which raises two important questions: What kind of load and how?

The modern power company needs a fundamental development program if it is to answer these questions efficiently—a program that will govern the growth of the system in balance with the growth of the business. Based on the limits of the territory to be served, it should survey the prospective load and definitely plan the rate at which it shall be acquired. And this means a program for sales expense, a program for construction expenditure, a program for increase in operating costs—all advancing in step with a program for increased revenues expected and a clean-cut schedule of financial requirements.

In other words, a system plan for a modern utility is something more than a plan for the generation, transmission and distribution of energy, for the collection of bills and raising of money and for the maintenance of good public relations. The present-day power company is a great business. It needs commercial leadership and business judgment. It needs orderly market development, the kind that plans ahead what classes of load should be acquired for ten years and in what proportions. And this sort of selling can be as scientific a job as the building of a dam. It is high time, therefore, to apply more engineering brains to the building of the business of the power industry.

Atlantic City Beckons

June 4-8

Fairchild Aerial Surveys

Once again the convention city calls the utility men to assemble for pleasure and profit. More than 40 addresses on timely subjects will be made by prominent men. Old friends and men with whom you can exchange experiences and discuss problems will be there

Leaders in Home Service

Pacific Northwest outstanding in domestic load building. 70,000 range customers contribute to high residential consumption. Railway electrification, hydro development and interconnection hold bright future

By WALTER C. HESTON
Pacific Coast Editor

Chelan plant, Washington Water Power Company

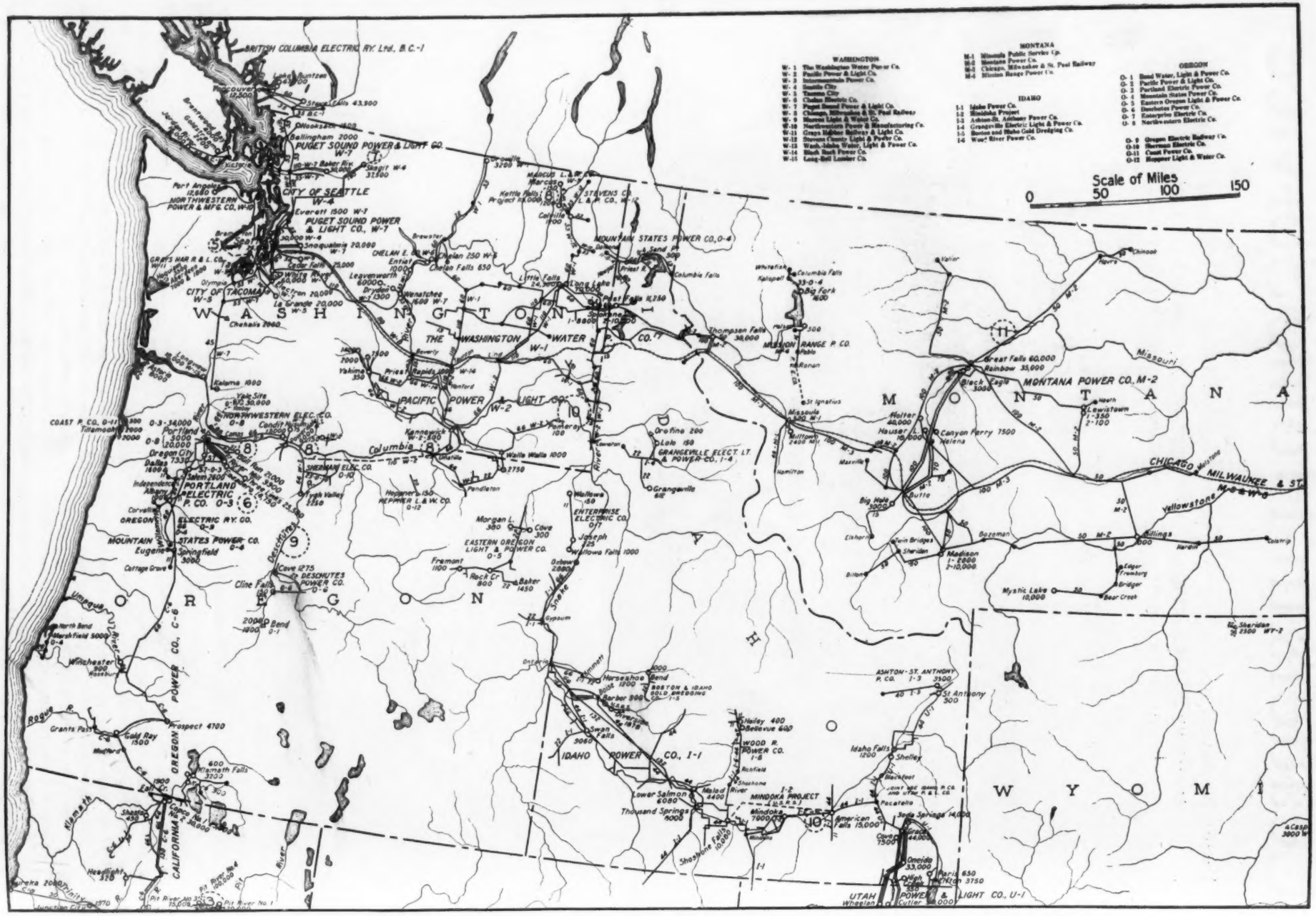
DEVELOPMENT of residential load is perhaps the outstanding accomplishment of the power companies of the Northwest, and having been leaders in this field they view with interest activities of utilities throughout the nation to get into tune with the commercial spirit of the day. Having an abundance of hydro-electric power, a limited industrial development and practically no unwired homes to which they might look for future growth, their efforts naturally have been directed to increasing consumption and revenue of existing domestic customers. Although the utilities of this section, which for the purpose of this article include the major utilities in the states of Oregon, Washington, Idaho, Montana and Wyoming, have been actively engaged in developing residential business for ten years or more, they are far from satisfied with results and are bending every effort further to increase residential consumption and revenue.

The electric range has been the chief contributing factor in this load-building program and the eight larger utilities of this section are now serving 70,226 range customers, bringing them an annual gross revenue of $2,809,000, or 26 per cent of the total revenue derived from domestic customers. Consumption of these ranges amounts to 34 per cent of the total energy sales to residential customers. New range users are being added at the rate of 17,500 a year, which means that 6 per cent of the available market is being sold each year, and there is every indication that this rate of sale will continue for several years. The largest number of range customers served by any one company is 22,369, on the system of the Puget Sound Power & Light Company. The Idaho Power Company has the greatest system saturation, with 31 per cent of its residential customers using electric ranges.

Taken in conjunction with water heating, the electric range has been responsible for very high average annual consumption per customer, reaching, in the case of the Washington Water Power Company, an average annual consumption for all domestic use in Spokane of 1,676 kw.-hr. The California-Oregon Power Company is a close second, with 1,423 kw.-hr. per year, and the Idaho Power Company is third, with 1,152 kw.-hr. per year. All companies show high averages, as will be seen from Table I. System data for eight major utilities are given in Table II.

Great possibilities lie in the development of the water-heating load also. The eight utilities referred to are serving 19,631 water heaters, which bring them a gross annual revenue estimated to be $900,000. These water heaters use annually 144,000,000 kw.-hr., which is 46 per cent of the total domestic energy sales of the companies concerned.

While intensive selling effort has been placed behind the electric range, and to some extent the electric water heater, increased use of lighting in the home and the



Water power predominates in the transmission systems of the Pacific Northwest

sale of small appliances has not been overlooked. Some of the central stations in this group have done a particularly good selling job on small appliances, notably the Idaho Power Company, the Washington Water Power Company and the Pacific Power & Light Company.

What the future holds in the way of domestic use of electrical energy in this section is indicated in Figs. 1 and 2, which are curves projected to 1932 to show anticipated sales to residential customers in the city of Spokane. These may be considered typical for many of the other utilities. From this it will be seen that average use per domestic customer is expected to reach the figure of 2,560 kw.-hr. per year by 1932.

Attractive rates offered by power companies of the Northwest have enabled two transcontinental railroads to utilize central-station power delivered at high tension for electrification of their roads. The Chicago, Milwaukee & St. Paul has under electric operation its Cascade, Missoula and Rocky Mountain divisions, totaling 646 miles of main line and utilizing 40,000 kw. at an annual load factor of approximately 50 per cent. During 1926 the Great Northern placed 25 miles of its main line over the Cascade Mountains in western Washington under electric operation and before the end of the year expects to have 80 miles of its line between Skykomish and Wenatchee, Wash., electrified. This electrification will require approximately 15,000 kw. and is of special interest because of the fact that motor-generator type locomotives operating from an 11,000-volt, single-phase, 25-cycle contact line have been adopted.

With central station hydro-electric power available at reasonable rates throughout the Northwest and with increasing tonnage it seems reasonable to expect further electrification of these two roads and to look for the other two transcontinental lines serving this region to embark upon electrification programs.

Chief among the industries of the Northwest requiring large amounts of power are lumber, pulp and paper and mining. Of these the lumber industry utilizes the greatest amount of power, but is electrified to a lesser

Bright Outlook for Northwest

By Guy W. Talbot
President Pacific Power & Light Company

BECAUSE industrial growth has been slow, the commercial departments of electric power companies in the Pacific Northwest have given their attention particularly to domestic load building. Here the increase in the use of electricity during the past few years has been most gratifying, in some districts the average number of kilowatt-hours used per residential customer having increased as much as 50 per cent. In fact, the average residential use in the Pacific Northwest is the highest in the United States.

The Pacific Northwest is latent with possibilities of industrial growth because of its great supply of raw materials and the large potential markets of the Orient. Greater industrial development, combined with the present large use of electricity in the home, will show a constant increase because of new uses, and greater extension of present uses, particularly in rural communities, makes it certain that this territory is destined to witness a most important development electrically. There is ample undeveloped power for future needs and there is an adequate developed supply for present needs and for the immediate future. Increased use of electricity, together with physical interconnections which serve to hold down fixed charges, will make for lower rates and, consequently, more universal use of electricity both in the home and in industry. These factors will contribute very materially to industrial progress through the use of power-driven machinery.

One of the big problems for the electric power industry, and all industries in the Pacific Northwest, and the entire country, for that matter, is to bring about a more equitable distribution of the burden of taxation, so that our public utilities, productive industries and agriculture may operate with greater economy. Real property and productive enterprises are bearing an altogether disproportionate burden of taxation. A pronounced impetus to

Guy W. Talbot

industrial development in the Pacific Northwest can be occasioned by holding down taxation on productive effort and keeping government interferences in business at a minimum consistent with the necessary protection of the public from unfair practices and unnatural competition.

Taxes are not a controllable item, nor can we thwart costly and burdensome restrictions of government interference. These repressive factors can be kept within reasonable bounds only by an informed and rational public opinion. They are not alone our problems but those of all industries. Industry today is interdependent and must ultimately feel the effects of all political action directed against public utilities. Our tax burdens cannot be made lighter nor held within present bounds except by lessened expenditures in government. Only by avoiding unnecessary governmental ventures in and too many restrictions to business enterprises and by preventing obvious inefficiency and waste will economy in government be achieved.

degree than either of the others. Sawmills of Oregon, Washington and Idaho cut about 15,000,000,000 b.-ft. of lumber a year, requiring approximately 1,000,000 hp. Although as nearly as can be estimated only 10 per cent of the mills are motorized, electrically operated mills have installed 500,000 hp. in motors and are responsible for 50 per cent of the total lumber production. For the most part mills produce their own electric power from steam plants burning mill refuse. Of the 375,000,000

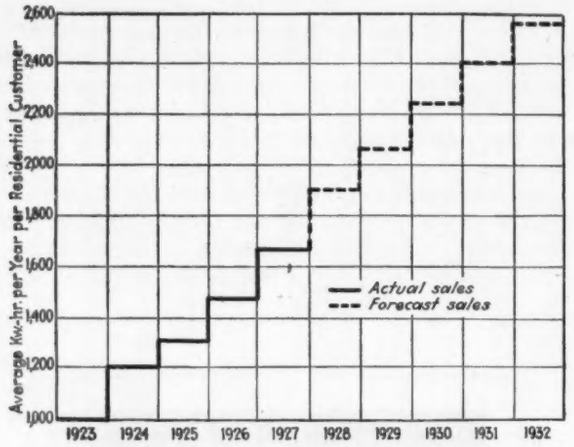


Fig. 1—Average kilowatt-hours per year per residential customer for city of Spokane

Actual increase from 1,000 kw.-hr. per customer in 1923 to anticipated use of 2,560 kw.-hr. in 1932

kw.-hr. per year utilized in electrically operated mills not more than 5 per cent is supplied by central stations. The reason for this is quite apparent. The mills fall into three general classes, those that are so remote from power transmission systems as to make the cost of extending lines prohibitive, those that are within reach of central-station power but still feel that it is more economical to generate their own power and those that have found some means of disposing of their waste and purchase central-station power. Thus it is largely a case of the cost of extending transmission lines or disposing of waste at a price that makes it economical for the mill operator to purchase power. For the most part sale of mill refuse has been limited to power companies and small industrial concerns for use under boilers in steam plants. Success with stoker firing of mill refuse in household furnaces and the development of processes for utilizing sawdust and "hog" fuel in the manufacture of pulp and wall boards is offering the mills a further means of disposal and the central stations an ever-increasing market for power.

Table I—Residential Consumption of Eight Northwest Power Companies for 1927

Company	Kilowatt-Hours per Domestic Customer: All Residential Consumption	Without Water Heating†
Washington Water Power Co.*	1,676	676
California-Oregon Power Co.	1,423	570
Idaho Power Co.	1,152	486
Northwestern Electric Co.	938	680
Portland Electric Power Co.	840	486
Puget Sound Power & Light Co.	774	532
Pacific Power & Light Co.	763	522
Montana Power Co.	504	483

*Spokane only.

†Derived by deducting 6,000 kw.-hr. per year from total residential sales for each water heater served and dividing by the number of residential customers.

The pulp and paper industry is rapidly coming to the front in the Pacific Northwest as Eastern sources of pulp wood are being depleted. At present there are 22 pulp and paper mills operating in Oregon and Washington, six of which are in Oregon and the balance in Washington. The daily output of these mills in paper products, such as newsprint, wrapping, writing, book, board and all other papers, is approximately 2,020 tons of finished product, for which the pulp requirements consist of sulphide, sulphate and soda pulp and total around 2,200 tons. In addition, two new mills are now building in Washington which will produce 270 tons of pulp daily and additions in an Oregon mill will add a production of 120 tons of newsprint daily. Newsprint production is the largest and as of the first of this year amounted to 1,077 tons per day for all mills. Other production was: Wrapping paper, 470 tons; writing and book paper, 125 tons; board, 220 tons, and tissues, fruit wraps and all others, 120 tons, daily.

From a power standpoint the 22 mills represent a total connected load of 136,827 hp., with an average power demand of 67,425 hp., a large percentage of which is central-station power. A few mills generate a small part of their power requirements either in hydro or steam stations, the steam being utilized in various processes after passing through the turbines.

Table II—Gross Revenue, Customers and Range Data for 1927 and Growth During Past Five Years

	Electric Gross Revenue	Total Electric Customers	Total Domestic Customers	Av. Rev. per Domestic Customer	No. Electric Ranges Served	Per Cent Range Saturation
1. Puget Sound Power & Light Co.	$10,251,720	131,192	100,380	$31.39	22,369	22.3
2. Montana Power Co.	8,796,526	48,844	35,900	27.62	6,436	17.9
3. Portland Electric Power Co.	6,166,952	95,800	84,085	29.41	11,557	13.7
4. Washington Water Power Co.	5,938,983	52,093	36,709	33.73*	9,223	25.0
5. Pacific Power & Light Co.	3,776,205	59,588	40,628	32.89	4,956	12.5
6. Idaho Power Co.	2,835,650	40,685	25,196	32.91	7,764	31.0
7. Northwestern Electric Co.	2,737,301	26,226	20,423	30.62	6,100	29.9
8. California-Oregon Power Co.	2,271,911	20,091	15,626	37.75	3,125	20.0
Total for all companies	$42,775,248	474,519	357,947	$32.04	71,530	21.5
Percentage increase for five-year period, 1922–1927, based on companies 1, 2, 3, 5 and 8	60	53	68	17	469	147

*Spokane only.

The paper industry as it has developed in the Northwest exceeds by far the lumber industry with respect to the class of plants built, engineering involved, high-grade equipment used and the large amount of electrical engineering involved, particularly if the plant is for manufacturing newsprint.

Until quite recently paper produced by the mills on the Coast and British Columbia was used to supply the Coast trade. Recently, however, certain of the plants have been shipping bleached sulphide pulp to the East Coast, competing with similar pulp coming into the east from Canada and abroad. Due to the low freight rates applying on material of this kind from the Pacific Coast to the Atlantic seaboard, it is said that it is possible to deliver pulp to New York or other Eastern seaports as cheaply as from the mills in Michigan, Wisconsin and Canadian points as well as pulp imported from Norway, Sweden and other foreign countries. With the vast undeveloped timber and hydro-electric resources of the Northwest the outlook for the pulp and paper industry is promising indeed.

There are two important mining regions in the territory under discussion. In the Cœur d'Alene district in Idaho there are extensive mining operations producing chiefly lead, zinc and silver; at Butte, Mont., is one of the largest and richest copper deposits in America.

These mining operations are all extensively electrified and central-station energy is used in all cases. At the Butte mines of the Anaconda Copper Mining Company 27,000 kw. is utilized at an annual load factor of approximately 80 per cent. At the Great Falls reduction department of the same company the load is approximately 65,000 kw., of which 50,000 kw. is utilized at an annual load factor of 95 per cent in an electrolytic zinc plant. This plant requires 1.73 kw.-hr. per pound of zinc produced and has an output of 335 tons of pure zinc each 24 hours. A plant of similar capacity is now nearing completion at Anaconda which will be operated by the same company.

At Kellogg, Idaho, the Sullivan Mining Company will place in operation in June a 50-70-ton electrolytic zinc plant which will utilize 8,000 kw. of central station energy.

The importance of the mining load to the Montana Power Company and its effect upon system load factor may be judged from the fact that 83 per cent of the energy sales of this company are made to mining properties. The annual system load factor is 81.5 per cent.

Data on system growth for the eight large Northwest power systems used as an index to show major trends are given in Table III. It will be seen that for the systems of the California Oregon Power Company, Pacific Power & Light Company, Northwestern Electric Company, Portland Electric Power Company, Puget Sound Power & Light Company, Washington Water Power Company, Idaho Power Company and Montana Power Company, which produce 82 per cent of the energy sold in the Northwestern states, 68,000 kw. of additional generating capacity is required each year based on the growth during the past five years. These combined systems, which are showing an over-all annual increase of approximately 20 per cent in energy produced, require $16,000,000 of new capital each year.

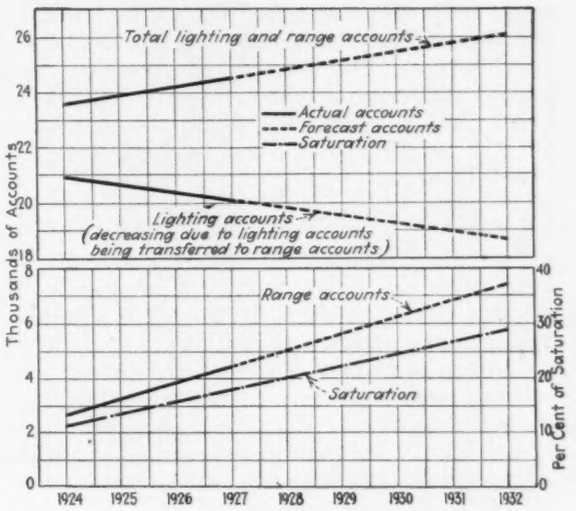


Fig. 2—Forecast of electric range business in city of Spokane

The greatest individual system growth has been that of the California Oregon Power Company. This company has more than trebled its installed plant capacity and has practically trebled its output in the past five

Table III—Composite System Data for Eight Major Northwest Power Systems*

	1917	1922	1927	Per Cent Increase 1917–1927	Per Cent Increase 1922–1927
Total installed hydro capacity (kw.)	423,155	564,605	865,182	105	53
Total installed steam capacity (kw.)	35,200	83,700	123,300	250	47
Percentage steam of total capacity	7.7	12.9	12.5	...	..
Total yearly generation (million kw.-hr.)	2,020	2,613	4,314	114	65
Total yearly hydro generation (million kw.-hr.)	1,977	2,482	4,088	107	65
Total yearly steam generation, million kw.-hr.	33	131	226	590	73
Percentage steam to total generation	1.6	5.0	5.2	...	..
Total electric energy sales (million kw.-hr.)	1,621	2,156	3,386	109	57
Total system investment (million dollars)	.....	$292	$371	...	27
Approx. miles of high-tension transmission over 6.6 kv	.....	6,899	10,621	...	54
Approx. miles of distribution lines under 6.6 kv	.....	12,413	21,698	...	75
Population of territory served (thousands)	.....	1,735	2,251	...	30
Total population of northwestern states, 1927 U. S. Census estimate (thousands)	.....	.....	3,930	...	..

*Puget Sound Power & Light Company, Montana Power Company, Portland Electric Power Company, Washington Water Power Company, Pacific Power & Light Company, Idaho Power Company, Northwestern Electric Company and California Oregon Power Company.

years. This has been due largely to wholesaling large blocks of power to the Mountain States Power Company on the north and to the Pacific Gas & Electric Company on the south.

Four of the eight major utilities of the Pacific Northwest are strictly hydro-electric companies and of the remaining four only 29 per cent of their capacity and 14 per cent of their generation are from steam. Taking the eight properties as a whole, steam plants constitute only 12.5 per cent of the total plant capacity and produce only 5.2 per cent of the kilowatt-hours generated. This condition has been brought about by the utilization of numerous small hydro-electric sites within short transmission distance from load centers and capable of low cost development. The potential water power capacity of Oregon, Washington, Idaho, Montana and Wyoming is given by the U. S. Geological Survey as 13,531,000 hp., of which 1,898,705 hp. had been developed up to the close of 1927.

Formerly Uneconomical Developments Becoming Economical

To one who views the situation from the outside it appears that power development in the Northwest is to undergo a radical change during the next five to ten years. Since a large part of the smaller economical sites have already been developed it will be necessary to look to the larger potential water powers, development of which has been uneconomical due to the fact that the rate of growth of any one or two systems has been insufficient to absorb a large block of power in a reasonable period of time. All of the eight systems mentioned, with the exception of the Idaho Power Company, are interconnected, but the ties are of relatively small capacity and not at all adequate to permit distribution of a large block of power which might be developed on the Deschutes or Columbia River to the important load centers.

With four of the eight utilities now under the same holding company management it would appear that development of the 260,000-hp. Kettle Falls site on the Columbia River or the 350,000-hp. Priest Rapids site on the same river and the transmission of this power over 220-kv. trunk transmission lines to the load centers of Puget Sound, Portland and Spokane is imminent. From Kettle Falls to Spokane is approximately 90 miles; to Seattle, 225 miles, and to Portland, 350 miles. Priest Rapids is almost equidistant from the three cities, the distances being approximately as follows: To Spokane, 150 miles; to Seattle, 150 miles, and to Portland, 175 miles. With the existing transmission network of the Northwest as indicated on the accompanying map and properly placed 220-kv. trunk lines it would be a simple matter to provide for a free flow of power from either of the above sites or any of several others to the power markets of the Northwest. Stream flow east of the Cascades is almost diametrically opposite to that west of the Cascades and the situation is ideal for development of one of the larger power sites in central Washington or Oregon as the next major step in expansion of Northwest power systems.

More Service at Reduced Cost

By Franklin T. Griffith
President Portland Electric Power Company

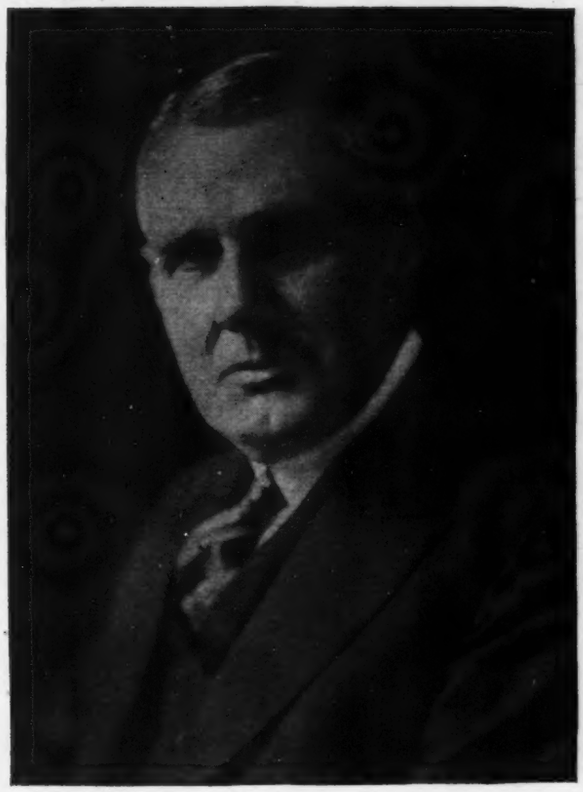
Franklin T. Griffith

IN practically every state in the Union the control of electric rates is vested in public service commissions. The fundamental principle of regulation is that the serving company is entitled to such rates as will permit it to earn the cost of operation, taxes and a reasonable return upon the value of the property devoted to public service. There is no guarantee that the utility shall earn such return, but there is, under regulation, ample protection against the establishment of extortionate rates that would produce more than a reasonable return on the investment.

The average cost to the consumer of electrical energy throughout the country, and particularly in the Northwest section, is lower now than at any time in history. This has been brought about by increasing the efficiency of operation and increasing the use of energy by consumers.

All rate schedules are designed to lower the average cost per kilowatt-hour as the consumption increases, so that today the average cost per kilowatt-hour served to the residences of Portland, for instance, is less than one-half of the average cost per kilowatt-hour ten years ago. There is every reason to believe that as use per customer increases, as it certainly will, the cost per kilowatt-hour of energy delivered will continue to decrease.

If the Federal Trade Commission, or any other fair-minded investigating body, investigates the rate structures of the utilities now serving electric needs in the Northwest, I am quite sure it will be found that the principle of regulation above referred to has been rigidly adhered to.



Public Understanding

Should Not Fall Behind Industry Growth

By H. T. SANDS
President National Electric Light Association

NOT only are the electric light and power companies of the country constantly striving for higher standards of public service but they realize how essential it is that public understanding of these utilities should not fall too far behind the growth of the industry.

The twelve-month period being brought to a close with the fifty-first convention of the National Electric Light Association has shown the industry to be increasing its contributions to the social and economic life of the country.

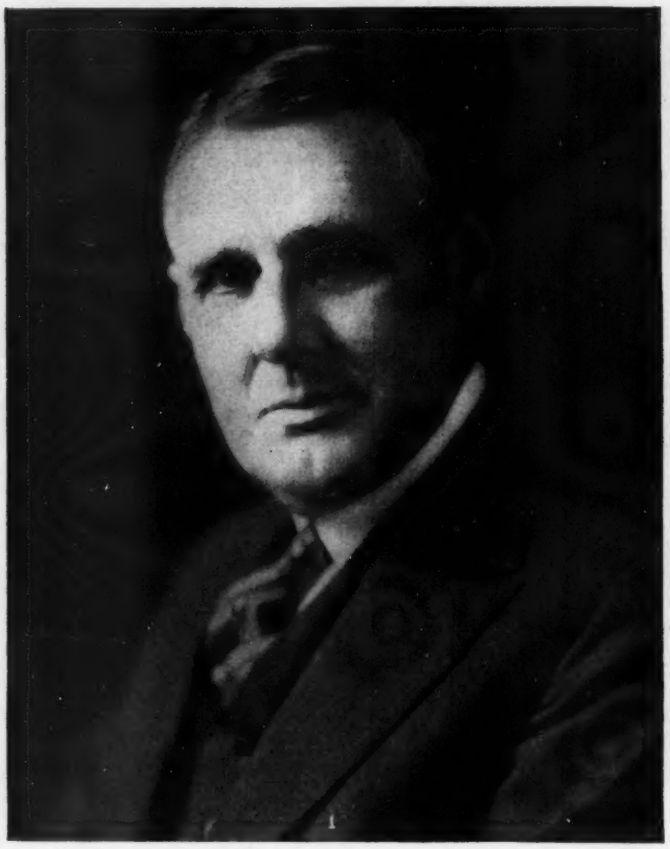
The household consumption curve is steadily rising. It is estimated that the average home in the United States consumed 5 per cent more electricity in 1927 than in 1926, and for this same period the average household bill for electric light and power increased only about 2 per cent. During 1927 the average cost per kilowatt-hour for domestic consumers decreased from 7 cents to 6¾ cents. This is incontrovertible evidence of the caliber of the service that the electric companies are giving to the country. These trends toward improved service and lower rates are continuing and it is apparent that the domestic load will become heavier as widespread appreciation of home electrification is fostered by electric light and power companies, manufacturers, contractors, jobbers and dealers.

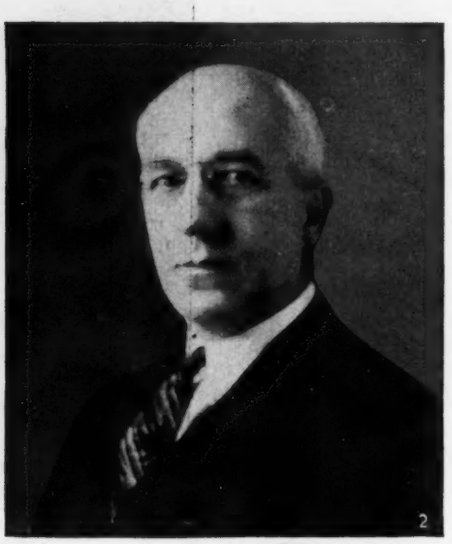
The amount of electricity employed in industry is dependent on industrial activity. This showed a diminution in some parts of the country for the first months of 1928, but manufacturing is now consuming more power in many sections. Not only is industry relying more each year on the power facilities of electric light and power companies but the rapid development of interconnection gives ample supplies of current. Not only are smaller cities attractive to industrial activities but other decided advantages of interconnection are reliability and economy. It was the interconnection of the private companies that saved the city of Los Angeles from being without light and power when the St. Francis dam collapsed.

The completion of the Great Northern project adds another unit to the electrified railroad lines, the huge sums of money involved in this work naturally retard rapid advancement, but the advantages of electric trains in some centers and along some lines are overweighing the difficulties involved. The electric light and power companies, also, are persistently pushing farm electrification and rendering to the rural sections the same advantages that are at the disposal of all city dwellers.

The industry has been busy and it sees, and all the members of this association see, that it will continue to be busy.

LEADERS of the N.E.L.A.





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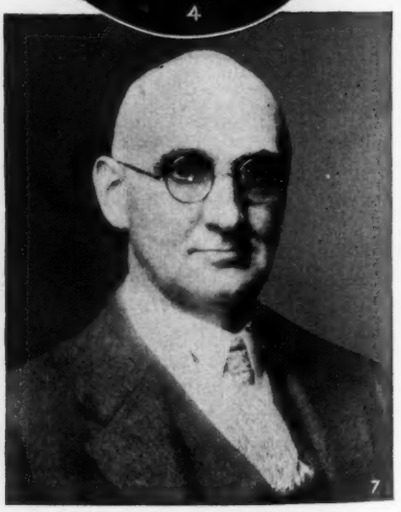


Serving Diversified Industry

Ohio, Indiana, Illinois, Michigan and Kentucky record notable utility progress. Dense populations and diversified industries require high service standards

By T. P. KINDIG
Western Editor

ELECTRIC utilities located in the East Central States of Ohio, Indiana, Illinois, Michigan and Kentucky have been confronted by no mean array of problems in developing and building their systems to supply an electric service that must at once meet exacting requirements in dependability and adequacy and be economically profitable from an investment and operating standpoint. In these five states slightly more than 20 per cent of the entire population of the United States is concentrated. The territory itself presents a wide variety of characteristics in that it contains a number of cities of metropolitan proportions, it is highly industrialized, agriculture is carried on extensively, mining and the production of raw materials are of great importance. A glance at the industries and resources of each state will show considerable diversity of business but nevertheless reasons for mutuality of interest between states.

CHARACTER OF TERRITORY

Ohio's leading industry, the manufacture of iron and steel, covers the entire northern and eastern part of the state along Lake Erie and down toward Pittsburgh. This state stands first in the output of pottery, machine tools and rubber goods and ranks second in automobiles and electrical machinery. Agriculturally it ranks fourth in the value of crops.

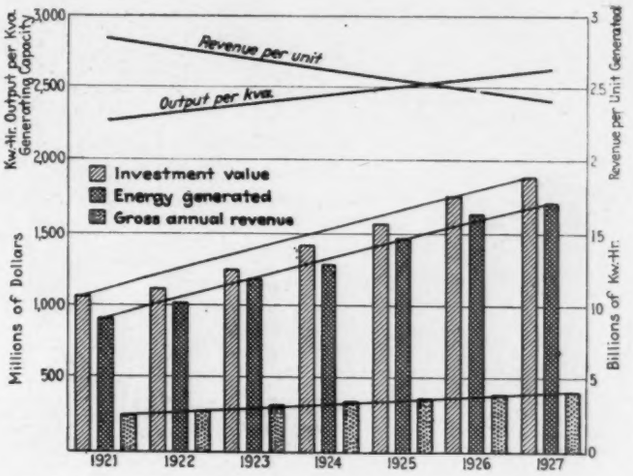
Indiana also has a large share in the production of iron and steel. It produces 70 per cent of the limestone used in the country for building and is a large producer of coal, petroleum, natural gas, pottery and cement. Almost the entire state is farmed intensively.

Illinois boasts of the second largest city in the United States. It stands first in the manufacture of meat products, agricultural implements and railroad cars. In value of farm products it ranks third and is one of the leading producers of coal and petroleum.

Michigan's production of automobiles is more than equal to the value of the automobiles produced in the rest of the country. It is the center of the country's furniture industry. Diversified farming gives the state a high rank in the total value of its crops and it is an important producer of iron ore, copper and coal.

Kentucky, long known as a great producer of tobacco, is rapidly taking on a distinctly industrial aspect. The state is a large producer of coal and its iron and steel industry is growing rapidly. It is an important railroad gateway for traffic from the South, West and North and a large amount of building material is produced in and shipped out of the state.

These five states have been the field of a vast commercial and industrial development during the past ten years. The central-station companies in this area have not only kept abreast of these developments but anticipated future requirements, fostered industrial and commercial development and extended their service as rapidly as practicable to the uttermost limits of the territory. How well they have done this and the consequent benefit to the public is told, in part at least, by the accompanying maps, graphs and tabulations.



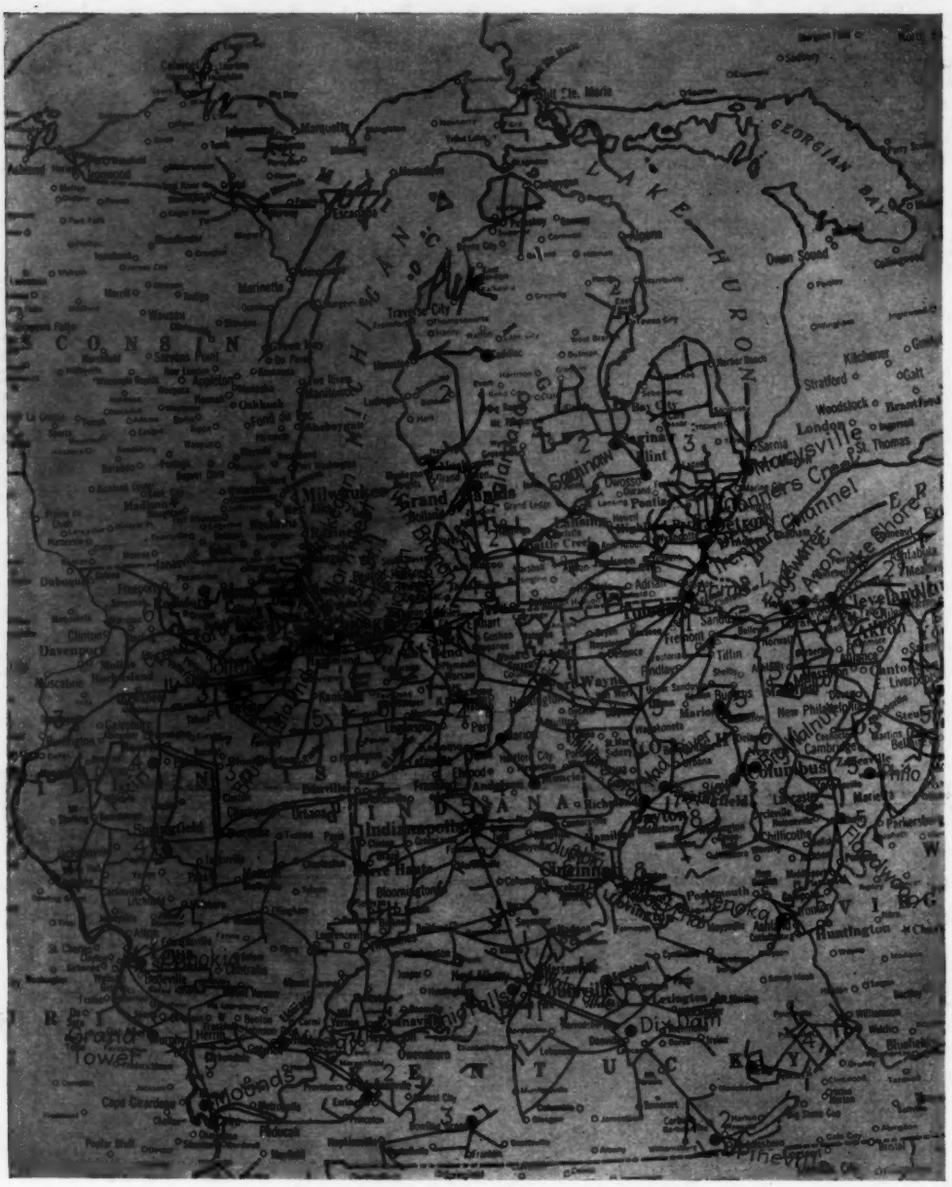
Relation of investment, energy generated and gross annual revenue

In the upper diagram it will be seen that the energy output per kilovolt-ampere of generating capacity has increased about 15.5 per cent in the past six years, indicating improved operating efficiency. At the same time the gross revenue received per unit generated has decreased 14.7 per cent, showing that the major portion of the economy has been passed on to the public.

SIX YEARS' PROGRESS

From 1921 to the end of 1927 the central-station companies added $830,789,700 to the investment value of their properties, an increase of 68 per cent. Generating capacity increased 79 per cent, to 6,645,000 kva.; number of customers grew to 5,084,200, or 78 per cent; gross revenue was raised 71 per cent, to $416,968,500; miles of transmission lines rose to 27,900, or 53 per cent; energy generated increased 101 per cent, to 17,285,000,000 kw.-hr.; population grew only 12 per cent, to 24,184,000, and the per capita production of electric energy rose from 395 to 715 kw.-hr. per year, or 85 per cent.

While the output per unit of generating capacity has been increasing, denoting better efficiency and more economical operation of power plants, the gross revenue received by the utilities per unit of energy generated has decreased 14.7 per cent in six years. In other words,



Illinois—2,342,000 kva.

1. Commonwealth Edison Company.
2. Public Service Company of Northern Illinois.
3. Illinois Power & Light Company.
4. Illinois Electric Power Company.
5. Central Illinois Public Service Company.
6. Illinois Northern Utilities Company.

Indiana—724,000 kva.

1. Indiana & Michigan Electric Company.
2. Indiana Service Corporation.
3. Northern Indiana Public Service Company.
4. Central Indiana Power Company.
5. Indianapolis Light & Heat Company.
6. Interstate Public Service Company.
7. Southern Indiana Gas & Electric Company.

Kentucky—259,000 kva.

1. Louisville Gas & Electric Company.
2. Kentucky Utilities Company.
3. Associated Gas & Electric System.
4. Kentucky & West Virginia Power Company.

Ohio—1,976,000 kva.

1. Toledo Edison Company.
2. Cleveland Electric Illuminating Company.
3. Ohio Public Service Company.
4. Pennsylvania-Ohio Power & Light Company.
5. Ohio Power Company.
6. Columbus Railway, Power & Light Company.
7. Ohio Edison Company.
8. Columbia Gas & Electric Company.
9. United Utilities Company.
10. Northern Ohio Power & Light Company.

Michigan—1,344,000 kva.

1. Detroit Edison Company.
2. Consumers Power Company.
3. Michigan Electric Power Company.
4. Michigan Gas & Electric Company.
5. Michigan Northern Power Co.

Total generating capacity in five states —6,645,000 kva.

Transmission system of the largest power pool in the Middle West, showing principal power companies' territories

the results of more efficient utility operation and larger customer consumption have been passed on to the public in the form of lower rates.

The principal load centers are in the large cities, which have grown to their present size because of certain natural resources or their adaptability to commerce. They are situated chiefly on the Great Lakes and the Ohio and Mississippi Rivers. These waterways have also provided the essential sites for electric generating stations. Electric power at low cost has been a considerable factor in furthering the industrial growth of these cities.

In recent years there has been a marked tendency on the part of manufacturing industries to locate their plants away from the large centers of population. This trend toward decentralization would have been greatly retarded, if not made wholly impossible, were it not for the fact that large blocks of electric power could be obtained from high-tension transmission lines of the utilities at points considerably distant from the metropolitan areas. Still another factor influencing utility development in the East Central States is the large number of small cities and towns which have grown up as local commercial centers of agricultural activity with comparatively little manufacturing interest. Most of the cities and towns of this size had electric service of a sort, supplied from inefficient local plants, sometimes municipally and sometimes privately operated, with little hope of improved service because of lack of capital, incentive and vision of future possibilities.

With these elements the electric utilities have been and are confronted with the following conditions of service requirements: (1) Large metropolitan centers combined with intensive local industrial areas: (2) medium-sized cities with increasingly important but less intense industrial activity; (3) small non-industrial towns which merge into and carry with them the problems of rural service.

The accompanying map, which shows some of the most important power stations and the network of transmission lines, tells better than words how the utilities have gone about meeting power requirements.

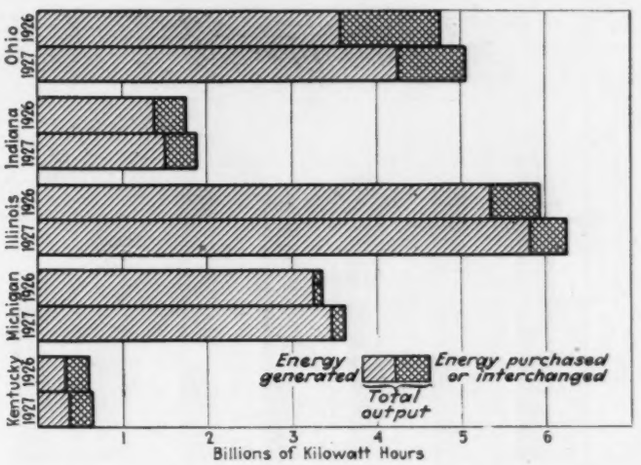
Total Number of Customers by States—Dec. 31, 1921, to 1927

	1921	1927
Ohio (total)	708,500	1,447,000
Domestic		1,228,000
Commercial		177,000
Power		42,000
Indiana (total)	372,000	611,200
Domestic		515,600
Commercial		237,290
Power		21,600
Illinois (total)	1,035,500	1,779,000
Domestic		1,470,740
Commercial		237,290
Power		70,970
Michigan (total)	604,000	1,016,300
Domestic		856,800
Commercial		132,800
Power		26,700
Kentucky (total)	137,000	230,700
Domestic		181,300
Commercial		39,200
Power		10,200
Totals—all customers	2,857,000	5,084,200
Domestic		4,252,440
Commercial		660,290
Power		171,470

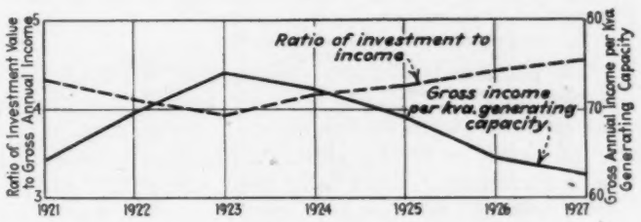
They have developed along several different lines: First, there is the power pool, where a number of large generating stations are located in and about the heaviest load centers. These stations are linked together with heavy tie lines and provision made for interconnection with other systems. Second, there is the territory where load concentration is not so heavy and generating stations are located advantageously for condensing water and coal supply, with radial or loop lines supplying the intervening territory and connecting with other systems. The third system plan also provides for advantageous location of generating plants, but because of the rather widely scattered nature of its territory considerable provision is made for interconnection and interchange of power with other utilities. A fourth general system is found in those territories which cover a wide area and whose power supply comes from hydro-electric plants and interconnection with other systems. Such systems employ longer transmission lines and as a general thing industrial loads are not as highly concentrated. There are, of course, many modifications of these classifications and some systems embody some of the elements of all.

Typical Systems

Typical of the first general plan are the Commonwealth Edison Company and the Public Service of Northern Illinois, which form the principal elements of the Chicago power pool. The Detroit Edison Company represents, in a single utility, the development of a power system to serve an intensely industrialized metropolitan district. The Cleveland Electric Illuminating Company, the Columbia Gas & Electric Company of Cincinnati and the Louisville Gas & Electric Company also represent this type of system in somewhat modified degrees. The second type of system is illustrated by the Penn-Ohio Power & Light Company at Youngstown, Ohio; the Illinois Power & Light Corporation and the Central Indiana Power Company. The Ohio Power Company, the Ohio Public Service Company, the Central Illinois Public Service Company and the Interstate Public Service Company in Indiana represent the third classification. Typical of the fourth general system plan are the Consumers Power Company in Michigan and the Kentucky Utilities Company.



Total output and interchanged energy, 1926 and 1927



Ratio of invested dollars to gross annual income has increased, while gross income per kilovolt-ampere of generating capacity has decreased

Central-station companies in the East Central States have been noted for pioneer engineering in adopting such things as pulverized fuel, high-pressure boilers and

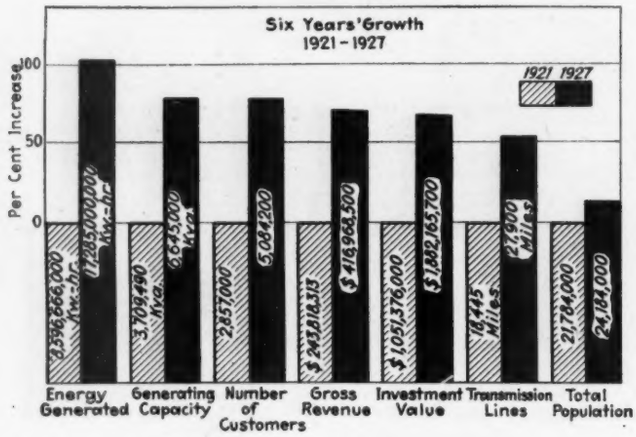
Total Output, Energy Generated and Interchanged or Purchased Power—1926 and 1927

States	1926 Total Output, Kw.-Hr.	1926 Generated, Kw.-Hr.	1926 Purchased or Exchanged, Kw.-Hr.	1926 Per Cent of Total	1927 Total Output, Kw.-Hr.	1927 Generated, Kw.-Hr.	1927 Purchased or Exchanged, Kw.-Hr.	1927 Per Cent of Total
Ohio	4,761,028,000	3,551,726,888	1,209,301,112	25.45	5,018,000,000	4,289,000,000	729,000,000	14.4
Indiana	1,758,435,000	1,361,028,690	397,406,310	22.62	1,850,000,000	1,475,000,000	374,500,000	20.2
Illinois	5,930,399,000	5,364,045,900	566,353,100	9.55	6,247,000,000	5,832,000,000	415,000,000	6.8
Michigan	3,392,813,000	3,288,314,360	104,498,640	3.08	3,578,000,000	3,456,000,000	121,200,000	3.85
Kentucky	513,800,000	327,832,000	185,968,000	36.00	592,000,000	394,700,000	197,300,000	33.3
Totals	16,356,475,000	13,892,947,838	2,463,527,162	15.10	17,285,000,000	15,448,000,000	1,837,000,000	10.7

turbines, large single-shaft generating units and base-load plants. They have also been consistent in producing energy at maximum economy. The Columbia plant of the Columbia Gas & Electric Company holds the record for thermal economy in B.t.u. per kilowatt-hour.

Added Generating Capacity

As a further example of this tendency to undertake large scale operations which reduce production costs and improve service to the public the project for the State Line Generating Company may be cited. The first unit



Six years' growth of electric utilities in five states

of this plant is now under way on the shore of Lake Michigan on the Indiana side of the Illinois-Indiana state line. This project contemplates the generation and sale of power to several Illinois and Indiana companies whose transmission lines have been brought to a common focus at that point. The proposed ultimate capacity of this plant is 1,000,000 kw. and the first unit will produce more than 200,000 kw.

Many additions to generating plant capacity are under way through the territory. The Detroit Edison Company is going ahead with the construction of its Delray No. 3 plant, the first unit of which will be 100,000 kw., and is installing the sixth 50,000-kw. unit at Trenton Channel. The Cleveland Electric Illuminating Company is adding the third 35,000-kw. unit at Avon. At Philo station of the Ohio Power Company 165,000 kw. is going in, while the Ohio River Edison Company is installing 37,500 kw. at Toronto. The Columbia Gas & Electric Company is increasing the capacity of its system by some 100,000 kw. by additions to its Columbia, West End and Millers Ford stations. The Louisville Gas & Electric Company added 80,000 kw. of hydro-electric capacity this spring when the Ohio Falls plant went into operation. A 104,000-kw. unit is going into the Crawford Avenue station of the Commonwealth Edison Company. A new plant, the first unit of which is 50,000 kw., is being constructed at Pekin, Ill., to supply the increasing demand for power in central Illinois. These are only a few of the additions being made to generating capacity, but they serve to show how the electric utilities in the East Central States are preparing in advance to meet the increasing demand for electric energy.

Transmission Networks

The extent of transmission lines and interconnection is fairly well indicated by the map of the area. In general, the lines radiate from the heaviest load centers—Chicago, Cleveland, Detroit, Toledo, Cincinnati, Louisville and those plants on the Ohio River and in eastern Ohio. They extend from Chicago to the Mississippi River at Keokuk and to the southwest connecting with St. Louis and also cross the heart of the Illinois coal fields. To the south the lines reach the southern limits of the state and will shortly be connected with the systems across the Ohio River in Kentucky. Interconnected systems link Illinois with Indiana at several points, and extend across the Ohio River at Louisville, tapping the water powers in Kentucky. Within the state of Indiana is a series of interconnected systems, some of which form loops and others direct lines almost across the entire state. These lines, in turn, are interconnected with the systems in Ohio. Kentucky, as just noted, feeds power northward into Indiana and is rapidly completing a transmission system which will tie together the two great coal fields in the southeastern and southwestern parts of the state. From Louisville lines extend south, east and north.

In Ohio there is one unbroken line extending across the state from the southwest to the northwest and into Indiana. From Cincinnati lines extend in every direction and directly across the state. The northwestern section is covered by one of the most highly interconnected transmission networks in the country. It is now connected with Toledo, from where lines extend into southwestern Michigan and westward to Indiana.

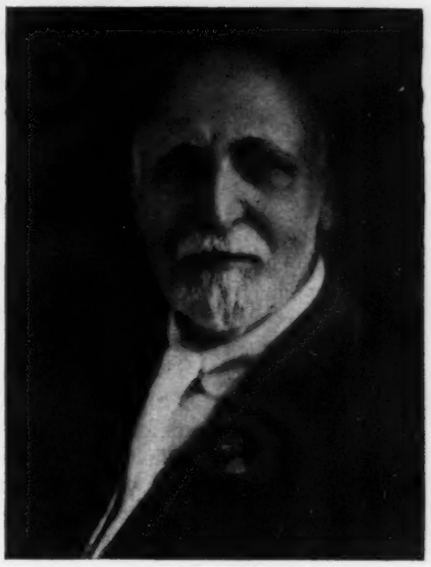
In Michigan there is the Consumers Power Company system, which in itself represents a great interconnection of transmission lines, hydro and steam plants. This system is now tied in with Detroit, from where lines extend into the thumb of the lower peninsula of the state.

Investment Values, Generating Capacity, Output, Gross Revenue, Population and Customers per Thousand Population, and Length of Transmission Allocated Among Five States

	Investment Value of Utilities		Generating Capacity, Kva.		Energy Generated (Thousands of Kw.-Hr.)		Gross Revenue		Population		Customers per Thousand Population			Transmission Lines (Circuit-Miles)	
	1921	1927	1921	1927	1921	1927	1921	1927	1921	1927	1921	1927	Per Cent Increase	1922	1927
Ohio.	$260,728,000	$538,284,000	1,318,370	1,976,000	2,520,000	5,018,000	$68,544,000	$120,933,800	5,909,000	6,710,000	132	216	62.5	4,560	6,815
Ind..	136,896,000	227,366,400	447,736	724,000	905,617	1,850,000	24,622,782	44,585,000	2,964,000	3,150,000	125	194	55.1	4,035	5,990
Ill....	381,064,000	661,778,000	1,154,180	2,342,000	2,984,134	6,247,000	81,167,444	150,552,700	6,627,000	7,296,000	156	244	56.2	5,120	7,620
Mich.	222,272,000	368,916,900	684,120	1,344,000	1,901,752	3,578,000	51,727,654	86,629,800	3,861,000	4,490,000	156	226	45.0	3,440	5,105
Ky...	50,416,000	85,820,400	105,084	259,000	285,163	592,000	7,756,433	14,267,200	2,423,000	2,538,000	57	91	62.8	1,310	2,370
Total	$1,051,376,000	$1,882,165,700	3,709,490	6,645,000	8,596,666	17,285,000	$243,818,313	$416,968,500	21,784,000	24,184,000	131	210	60.3	18,445	27,900

Domestic Load Development

By Alex Dow
President Detroit Edison Company



Alex Dow

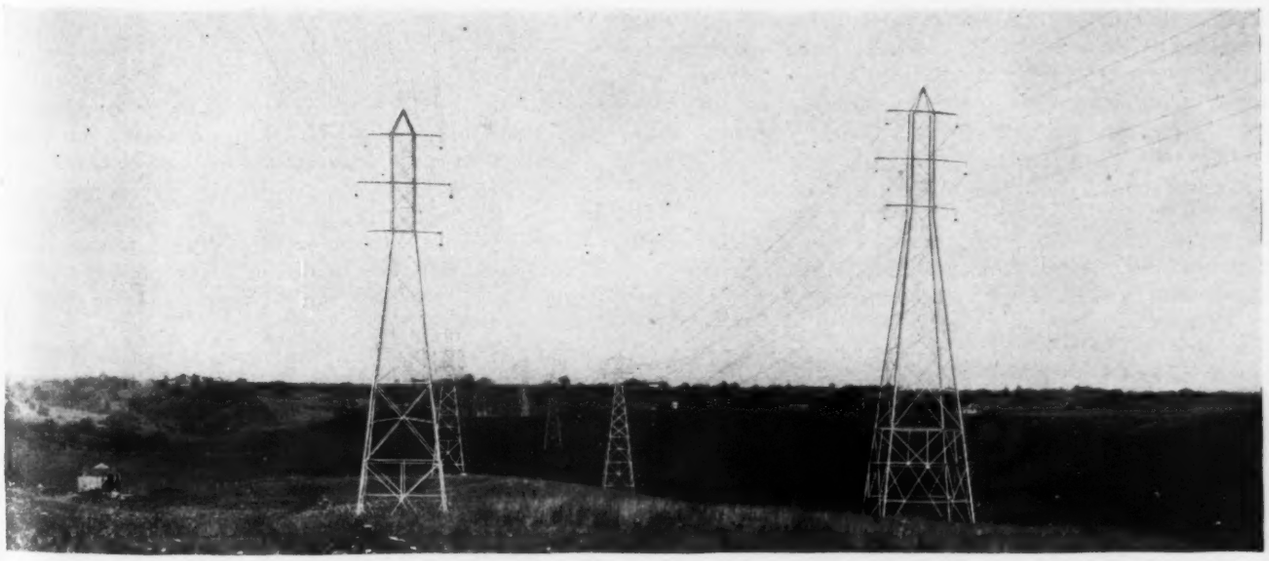
ON THE assumption that there will be an average annual use of not less than 1,300 kw.-hr. per domestic customer, the Detroit Edison Company now has in progress the rearrangement and reconstruction of its secondary circuits in the residential districts. This rearrangement is, of course, a slow job. It begins where it is likely to be most needed and it will be two or two and one-half years in extending to the lines where there is at the present time a comfortable excess capacity above the recent use of about 560 kw.-hr. per average customer.

To develop domestic load good service, particularly maintenance of voltage, is a *sine qua non*. A reasonable rate schedule is another. A schedule which, regardless of its make-up in the earlier billing blocks, will offer a sharp reduction in the rate for supply above the present average is desirable, and is successful in places where it is already adopted. A last condition, which is not so well understood as it ought to be, is provision for quick servicing and cheap replacements of domestic appliances. If the makers of range-heating elements, for instance, could get together and standardize on their sizes and connections it would be a big help to sales.

Lines also extend into the southwestern part of the state from Indiana and other interconnections are under contemplation.

While some of these interconnections are suitable only for local interchange of power, there is a very definite tendency toward increasing the capacity of these tie-ins and the revamping of lines to transmit larger blocks of power.

While the work of tying separate systems together is going ahead, it is interesting and significant to note how much energy is exchanged between systems. A comparison has been made of the total amount of electric power interchanged by the utilities in the five states in the years 1926 and 1927. In 1926 2,463,527,162 kw.-hr., or 15.1 per cent of the total output, was either purchased from or exchanged with other utilities, but in 1927, while the total output increased, the interchanged energy amounted to only 1,847,000,000 kw.-hr., or 10.7 per cent. This does not mean that the interconnection of systems is any less important, but rather that systems formerly purchasing a considerable part of their power have found it economical to increase their own generating capacity. Also, some companies formerly operated separately and which purchased power have been consolidated or merged with the supplying company and the power transmitted is now reported as the total output of



Four 66-kv. circuits from the Columbia terminal of the Columbia Gas & Electric System

one system. Interconnection has therefore been the means of pointing the way to the most economical method of serving a given territory from the system of a single well-organized and operated utility.

Commercial Development

Commercially, the central-station companies in the East Central States have expanded just as rapidly as they have physically. Few companies in 1921 had well-organized new-business departments. As a result of the war and post-war conditions the utilities' commercial departments were reduced in personnel and for the most part were working with skeleton organizations. It has been necessary, therefore, virtually to create entirely new sales staffs, map out and carry through sales programs and redevelop the central-station sales technique. That this has been done well and efficiently may be seen by comparison of a few significant figures for 1921 and 1927. The total number of customers has been increased by 2,227,200 from 2,857,000 in 1921. Total kilowatt-hour sales have more than doubled, and while the population of the area has increased by about 12 per cent the use of electric energy per inhabitant has grown from 395 kw.-hr. to 715 kw.-hr. per year.

From an industrial power standpoint utility commercial departments have worked closely with the manufacturers in their territories. Electrification of industry has gone ahead rapidly with the aid of the central-station power sales engineers and the trend toward decentralization of industry, previously mentioned, must be credited largely to the extension of reliable utility service into nearly all parts of the east central area. This trend has gone hand in hand with the commercial and physical development of the power companies.

Customer Ownership and Public Relations

While the central-station industry has been expanding its systems and service, at the same time it has not over-

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The Backward Child

By T. O. Kennedy
Vice-President Ohio Public Service Company

"DON'T give her a book for Christmas; she has a book." This is an old joke, but immortal because it has much wisdom in it. Apparently we electric utility executives, as a class, have never seen the point of that merry jape. If it were plain to us we would long ago have seen its obvious parallel in our industry.

"Why try to sell electric service to the people of the United States? They already have electric service."

There is hope that the point will finally become clear. It ought to because a lot of men are trying to explain it with charts, curves, diagrams and geysers of words, accompanied by much appropriate gesticulation. All are saying that just as the possession of one book does not prevent the enjoyment of many more books, so the fact that electric service is in the home does not prevent its extension to many more profitable uses.

Compared with other nations, our country is the leader in electrification progress, industrial, commercial and domestic. Our arms have developed swivel joints from patting ourselves on the back, but at the same time we calmly admit that one-third of our total business is unprofitable and we refuse to let it bother us, much less do we take effective action to correct the condition.

We are agreed that the residence business on our lines as a whole is hardly more than paying its way—if it is doing that. We are agreed that this business can be made to pay an adequate return, a return that will be open to no criticism because it will be accompanied by lower rates and greater service to the users of energy. We have the necessary equipment, devices and appliances already developed and of proved ability to build up the residential load. All we have to do is to get these energy-consuming devices on our lines by selling, either selling them ourselves or by encouraging others to sell.

The essential thing is not the manner in which appliances are put on the lines; it is to get them there. In the small progress already made by the commercial spirit in the electric utility industry the end has always been obscured by the means; among all the trees we have lost sight of the forest. In talking and worrying about how the job should be done we have forgotten the job itself.

T. O. Kennedy

The commercial development of our business in the widest field of electricity application, the home, has not got over the first hurdle in the race. That hurdle is executive interest. Not the interest that expresses itself in a mild, "Yes, yes, that's right. We ought to do something about that some time," but an active interest that manifests itself in enthusiasm, in an appreciation, not only of the size of the job but of the reward to follow its completion, and in participation in the work.

The electric utility industry is more than forty years old. It is commonly referred to as being still in its infancy, but with a brilliant future. This must be true because in one regard at least, domestic service, it is a terribly backward child.

It is time that the utility executive, the daddy of the electrical industry, took a more active interest in the rearing of his child.

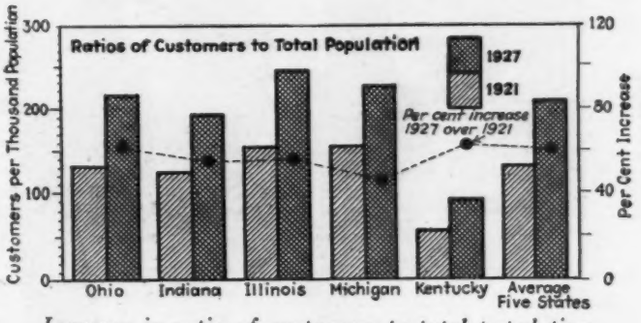
looked the value of taking its customers and employees into partnership through the sale of preferred stock, and there is scarcely a company which cannot boast of the fact that a large per cent of its customers are also stockholders. Many companies have established a fixed policy, when new capital is required, of obtaining part or all by the sale of its preferred stock direct to customers. So well has this practice been received by the public that frequently the stock issue is far oversubscribed within a few days after its first offering. Such an attitude on the part of the public speaks volumes for the cordial relations between the utilities and their customers and belies any alleged need for an investigation of the practices of these utilities.

In the construction of additional transmission systems and generating stations, work is going ahead in an orderly manner. There is still some work to be done in allocating certain territories and districts to those companies best situated to provide service. This will be carried out by carefully planned merging of systems and properties. The public ultimately will benefit from these operations, as it has in the past, by receiving better service at a lower cost as the consumption of energy increases.

Future Growth

That there is in prospect an enormous growth for the utilities serving the states of Ohio, Indiana, Illinois, Michigan and Kentucky is inevitable. Looking into the future, it would seem that they are but on the threshold of a vast expansion program.

Past experience shows a steady increase in population, which may be expected to continue and bring added service responsibility to the electric utilities. But volume of new customers as such will probably be the least source of additional load. The industry will have to concentrate its efforts on more intensive development of existing loads. In the last six years the per capita consumption of electric energy has almost doubled. Industrial applications and uses for power are increasing and many large industries are finding it most profitable to purchase their power requirements from the electric utilities. Further electrification of the railroads is imminent. Commercial, street and highway lighting intensities are mounting higher and using more energy. Domestic use of energy is still largely undeveloped.



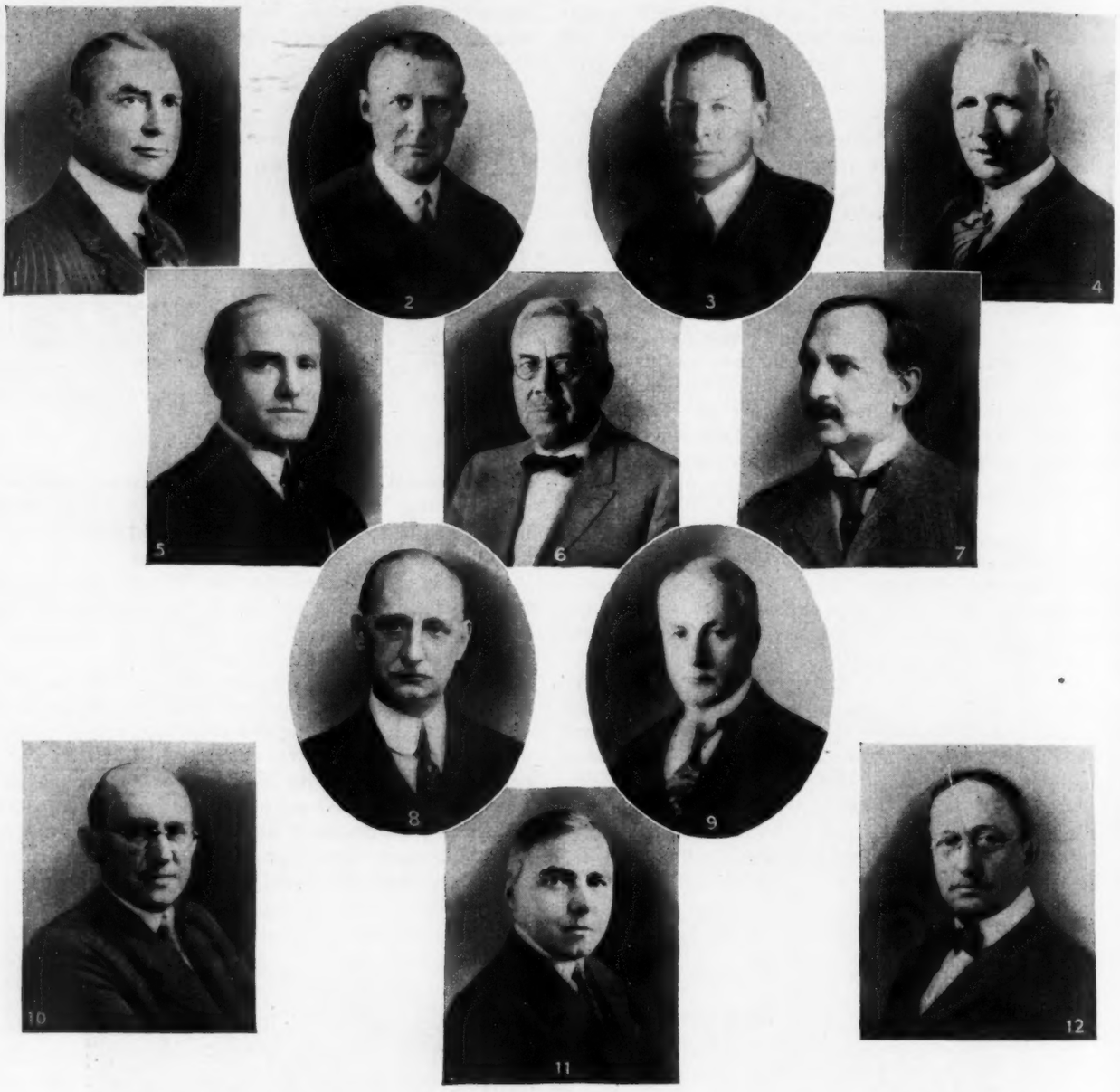
Increase in ratio of customers to total population, 1921 to 1927

These general conditions and trends alone indicate the necessity for the electric utilities ever to be building in advance of these demands and to anticipate, in so far as possible, use potentialities.

It has been estimated that by 1950 the total consumption of energy in the territory would be 54,000,000,000 kw.-hr., with a coincident demand upon generating stations of 13,500,000 kw. This would require an installation of about 15,000,000 kw. total capacity to provide ample reserve. Based on these estimates of consumption and increased population the combined consumption for all uses would, in 1950, amount to 1,650 kw.-hr. per capita. Viewed in the light of the progress that has been made in the last six years it is hazardous to predict what may happen, but it seems safe to say that any available estimates of future growth that have been made thus far are ultra-conservative.

Airplane view of the highly efficient Columbia station

Special National Committee Chairmen



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New England Optimistic

Progress in engineering, management methods and commercial activity points to greater triumphs in store with mutual benefits to companies and public

By Howard S. Knowlton
New England Editor

IN THE year 1919 the power companies of New England faced many problems. Prices of material and labor had risen to levels which strained the resources of the ablest management to overcome without burdensome increases in rates. Plants had expanded far beyond pre-war ratings and the trend of future loads was uncertain. Interconnection had made a good start in demonstrating its economic value as well as its military necessity, but comprehensive plans for further development were in an embryonic stage. Individual management prevailed in companies serving many important areas, and the holding company had not hit its stride in the advance of the regional industry toward widespread centralization. Personnel was more or less disrupted in organization and effectiveness by the demands of the war. Relations with the public were good but casual as compared with present conditions. Promotional rates were little known and commercial activity was extremely spotty in character and location. Executives were beset with difficult questions of policy, as to financing, engineering, load building and many other matters upon the wise handling of which depended the economic prosperity of the operating properties and to a large extent the success of the communities served by them in the readjustment period immediately following the conflict.

At the peak of the price curve in 1920 the transition of New England from a wartime basis of plant development and operation was well under way, and in this transition the utilities have played an outstanding part, carrying on through years of economic stress and contributing invaluable service to their territories. If electrical methods were absolutely necessary to war industries they have been scarcely less so to the manufacturing and business organizations of these states in the post-war era of readjustment. It is no mean achievement of private management to have met the demands of the public in such an unprecedented period so effectively that advocates of government ownership have been able to make little impression upon the popular mind in the northeast; that rates have been lowered all along the line, and the growth of the utilities economically guided to a status of financial stability and earning power surpassing all previous experience.

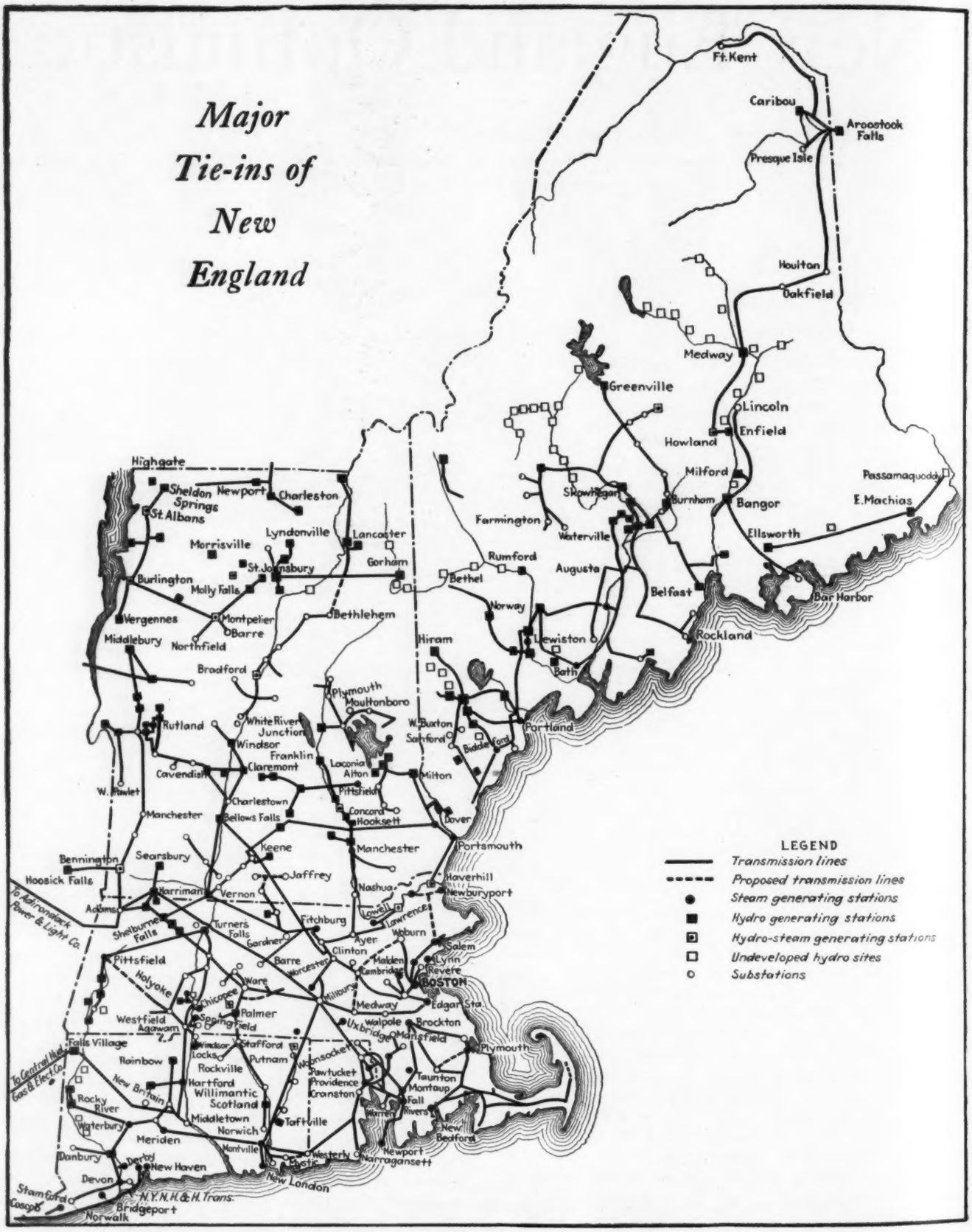
Diversified Service Required

Maine, New Hampshire and Vermont, the three northern states of New England, embrace large agricultural areas, raw material districts, mountain, lake and river country of marked variety and appeal and many small cities blessed with diversified industries. The three southerly states of Massachusetts, Rhode Island and Connecticut include much attractive farming land and hill country, but in general constitute the major workshop of this region. The railroad trunk lines between Boston and New York are the equivalent of a set of industrial busbars to which are connected diversified factories producing an extraordinary range of commodities in whose creation and distribution electric service is a necessity of the first order. These last-named states contain many cities of rank in American industry and the density of population is such that their effective service by major steam plants on tidewater and by transmitted hydro-electric power from the interior western and northern areas of New England is desirable business.

Interconnection Progresses

This interconnection of interior plants with tidewater stations by transmission systems has made remarkable strides since the war, and with the exception of Maine the New England States are interlinked with resulting advantages in the utilization of plant investment, transfer of energy to load centers, supply of power during emergencies, marketing of secondary hydro power, use of diverse river flows and decentralization of industry. Maine's law prohibiting hydro power export bids fair to be repealed or modified within a few years at the latest, and when this is done many millions of dollars will undoubtedly be invested in hydro-electric and transmission developments in the Pine Tree State to enable surplus power to be marketed outside and intrastate industries attracted, served and developed on a scale much beyond the present status. Comprehensive plans have been drawn for the development of water powers in the Penobscot and Kennebec Valleys and the construction of trunk transmission lines from central and southern Maine to connect with eastern Massachusetts systems and load centers. These plans include lines from the Passamaquoddy Bay tidal power development in case this works out satisfactorily. Still farther afield, the proposed hydro-electric developments in the St. Lawrence Valley and various projects in Quebec are being studied by New England utility engineers and executives in relation to possible future interconnection with the transmission networks planned and already existing on the American side of the frontier.

During the past seven years many important lines have been built in New England with the objective of interconnecting plants, systems and load centers. Among these are circuits tying the New England Power Company system to that of the Edison Electric Illuminating Company of Boston; a 110-kw. trunk line from the Harriman station of the former company to its load-dispatching center at Millbury, Mass.; a new line from



WITH the exception of Maine, every New England state is now interconnected with its fellows by important transmission lines. Recently built 110-kv. trunk lines connect the Adirondack system on the west with the Edgar station near Boston, and the new Bellows Falls plant of the New England Power Company in Vermont with eastern Massachusetts load centers.

Bellows Falls, Vt., to Pratt's Junction, Mass.; lines connecting the New England and Connecticut Company systems with those of the Adirondack and Central Hudson companies; a tie between the Turners Falls Power & Electric Company system and Hartford, forming the trunk connection of the Connecticut Valley Power Exchange; a line from Turners Falls to Pittsfield, Mass.; a line across southern New Hampshire from Keene to Dover, and a line across southern Connecticut from Meriden to Montville. Many shorter lines have also been built, so that today substantially all important properties in central and southern New England with the exception of the United Illuminating Company of New Haven are interconnected and in many cases are negotiating or planning for still further interchanges of energy. Many municipal plants purchase and distribute energy transmitted by this central network of 110 and 66-kv. lines. In Maine important line construction has taken place in connection with the expansion of the Bangor Hydro-Electric Company's system northeast of Ellsworth and in relation to the marketing of power from the Gulf Island development of the Central Maine Power Company. Interconnection of the Central Maine and Portland systems has also been effectively achieved.

Mercury Versus Steam

Outstanding developments in generating station design in which pioneer work of the first order has been done may be credited to New England during the post-war period. The most conspicuous are, of course, the 1,200-lb. Edgar steam plant of the Boston Edison Company at Weymouth, Mass., and the mercury vapor installation of the Hartford Electric Light Company at Dutch Point, now being followed by a 10,000-kw. (plus 10,000 kw. in steam production from the mercury process) unit at the latter's South Meadow station. The Edgar station has produced energy upon a fuel consumption of 1 lb. or slightly less per kilowatt-hour, and the Hartford installation points the way toward still further fuel economies on a large-scale plant basis. The executives and engineers of each of these companies are backing their convictions as to the over-all merits of these two systems of power production by appropriating substantial funds for their further installation and expansion. Both processes have passed beyond the experimental stage and the race is settling down to a contest in which service results on a large scale and economic performance, including all costs and charges, will be most instructive to the producer of mass power from fuel. Other important steam plant construction, such as the Devon station of the Connecticut Light & Power Company, the Somerset station of the Montaup Electric Company near Fall River, Mass., and the rehabilitation of the South Street station of the Narragansett Electric Company in Providence can only be given passing mention at this time, to say nothing of betterment and new construction work at Portland, Lewiston, Lynn, Salem, Bridgeport, Stamford and other tidewater points. The trend of the times is away from interior fuel-burning plants in this territory, with few exceptions, the formula being "steam power production at tidewater plus hydro power in the hinterland.

Notable hydro-electric plant construction of the past seven years in New England includes stations at Gulf Island, Me.; Davis Bridge and Bellows Falls, Vt.; Searsburg, Vt.; Sherman, Vt.; Glen (near Rutland, Vt.); Holyoke, Mass. (Holyoke Water Power Company); Mollys Falls, Vt., and Rocky River, Conn. A force of engineers is at work on the tidewater project at Passamaquoddy Bay. Studies are being made of many undeveloped sites in northern New England and Maine. When co-ordinated with the fuel-burning plants on the seaboard these hydro developments usually prove advantageous from the operating standpoint and potent factors in fuel saving.

Load Bulding Problems

From operating residential cellar stairway pilot lights and curling irons to driving locomotives in main line electrification and melting brass in the crowded industries of the Naugatuck Valley, central-station service in New England exhibits a range of great usefulness. During these past few years leading companies have increased their residential kilowatt-hour sales from, say, 250 per year to 400 and over per metered installation. Sales energy is now concentrated upon increasing domestic consumption through promotional rates and vigorous appliance merchandising. A few venerable utilities still remain unconvinced that appliance merchandising is a desirable central station function, but general industry opinion in Yankeeland is all the other way. Electric refrigeration is making rapid progress and electric cooking is winning headway, some very notable hotel installations having been made of late. Several utilities now are selling electric appliances at the rate of from $500,000 to $750,000 worth per year.

Many pages could be written about the progress of New England in industrial power and electric heating applications if space allowed. The sale of electric motors in New England from week to week often exceeds the $50,000 mark, and the shifting tides of fashion, changing demands of the market for commodities, rehabilitation of factories and attack on industrial and mercantile wastes create a constant market for modernized power units and improved control equipment. In the past six years a single industrial power sales department of a utility organization increased the connected power load 29 per cent, increased the power sales in kilowatt-hours 89.5 per cent and increased the power revenue 116 per cent. In the Naugatuck Valley of Connecticut as far back as 1924 about 90 per cent of the brass melting was done electrically and about 50,000,000 kw.-hr. per year was consumed in this work. The varied metal-working industries of lower New England are rapidly adopting industrial electric heating for approved processes, and in Boston, Worcester, Hartford, Rhode Island and many other places pioneer work has been done in this field with resultant large-scale commercial progress. The central stations have contributed largely to the betterment of working conditions and control of quality production in countless industrial plants by power, heating and up-to-date lighting installations.

Seven years ago commercial activities in New England utilities were less well organized, policies were almost as varied as the personalities of the executives in control, rates were going along without much regard to inducement features and the regional interchange of ideas among sales forces was not much in evidence except among the fortunate few whose expense accounts were allowed to reflect convention attendance. Conditions have now greatly improved. Staffs have been increased and leadership organized for more intensive coverage. Through N.E.L.A. activities and encouraged association of specialists from different parts of New England for the discussion of field methods load building has attained a new impetus. Commercial and industrial lighting has made great strides within the past few years

as a result of the organization of divisions of sales departments to push this class of work. Prior to 1920 the value of systematic development of commercial lighting was far less generally appreciated. The prize-winning work of the Boston Edison Company in this field has received national recognition.

Holding Companies Increase

Within the past three years many "old-line" New England power companies have been acquired by holding company or management groups. The upheaval of this movement is still undulating and the industry is still in a transition stage from an era of individualized management to a period of centralized management. The so-called "independent" companies are gradually either being acquired by groups or are participating in the holding company movement. A goodly number of these properties remain intact at this writing, but scarcely a week passes without news of some advance toward group operation in this or that locality. The results of centralized management are attracting interest everywhere, and it is a fair statement that many areas in New England are now obtaining improved service at rates which would have been out of the question under the old régime

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Non-Exportation Law Results in Waste

An Interview with

Walter S. Wyman
President Central Maine Power Company

Walter S. Wyman

"DURING the past winter the Central Maine Power Company has had a large amount of water power go to waste. At the beginning of 1927 we estimated that we should have a surplus of about 125,000,000 kw.-hr. during the year. As a matter of fact, the total amount going to waste last year was 131,000,000 kw.-hr. The same proportional waste has continued through the first quarter of 1928. This means that if we had business to use all the energy which our water-power plants could produce the present waterwheels and generators could have turned out 131,000,000 kw.-hr. more than they did.

"At the present time quite a few candidates for political office are saying a lot about Maine's water power and about the importance of 'keeping this priceless heritage for our children's children,' and so on. One of their favorite expressions is to question whether there is any surplus or not, and beginning with that question they conclude, presumably from sources of information which are available exclusively to them, that there is no surplus, so that there is no real need of exporting power. Regardless of this, however, it is a fact that there was a developed surplus on the Central Maine Power Company property in 1927 of 131,000,000 kw.-hr., and while I have no accurate information on the subject, I know enough about the situation to feel very confident that if the power wasted by the other companies in the state were added to this amount the total power going to waste at the plants of the Maine public utility companies in 1927 was more than 200,000,000 kw.-hr. Had the companies been able to sell this waste power their expenses at the power stations would have been no more than they were. Whatever revenue could have been obtained from this sale would have gone to cut down the expenses of the power companies and make more rapid rate reductions possible.

"It is true that not all of this power is available every day in the year, but this does not detract from the business importance of selling it. Since the 1927 Legislature adjourned more than 4,000,000,000 kw.-hr. has gone to waste on the undeveloped portions of Maine rivers. It will be many years before this very large amount of power could be used in Maine. Much of it might be developed and used during the next few years if it were possible to export the surplus. To say that this power, once exported, will never afterward be available for use in Maine seems the rankest kind of nonsense. All the other states in this country are allowing free passage of electricity across their borders. Many of them are prospering to a far greater degree than Maine. In no case has export deprived the local market of electricity. If export were permitted, the state of Maine might realize in taxation alone from $500,000 to $1,000,000 a year. We would have available and ready for use sufficient cheap power to attract large power-using industries, and Maine might begin to produce the raw materials used in many kinds of industry. Business in the state would go forward with no uncertain step; labor would find employment in large amount. All these things could happen without changing in any way the 'heritage of our children's children.'

"This matter of changing the state's policy in regard to exportation of power is extremely important. The law as it now stands seriously hinders our industrial progress. I have expressed the hope to our stockholders in very much the above language that they will make their influence felt to have this law changed, and the widest possible publicity of the facts in regard to this situation is desirable in order that a way may be found to remedy this great economic loss."

of local control. New generating plants and lines have been financed by more and more holding companies with great benefit to the regions served, and a vigorous effort to reach the rural customer is apparent in many localities formerly debarred from adequate line extensions. The remaining large independently operated companies, however, include some of the strongest, finest equipped and best managed utilities in the industry, and it would be farcical at this time to blow "taps" over the camp of isolated management. Thus far New England's experience with the holding company, whether "home ruled" or "foreign," has generally been encouraging and promising. In most cases the new interests have had the wisdom to capitalize the experience and local standing of competent managers and staffs already on the properties. The combination of technical, financial and managerial resources resulting from the correct application of the holding company principle has opened the pathway toward development often beyond the capacity of the isolated property to attain. Many problems, however, remain to be solved by each type of management, and the next few years will probably witness striking progress toward the common objective of each—maximum service at fair rates under the best modern methods.

Utilities Advancing in New England

An Interview with

Charles L. Edgar
President Edison Electric Illuminating Company of Boston

Charles L. Edgar

"NEW ENGLAND utilities have progressed in so many ways since the close of the war that it is not easy to pick out their foremost achievement," said Mr. Edgar in response to a request by an ELECTRICAL WORLD representative that the dean of the industry in the Northeast give his impressions of regional electrical development since 1920 to the readers of this publication. "Growth along nearly all major lines of usefulness is perhaps the outstanding point which we may stress. New England is an old section of the country, undergoing many changes, but nowhere has the electrical industry been of more assistance in facilitating the development of new methods in manufacturing, in improving ways of doing business and in enriching living standards. The industry has prospered in this expansion, and it is today serving the public, broadly speaking, at prices not only far below the line of cost increases forced in other industries by the World War but generally under pre-war levels. There is reason to believe that the public at large is becoming 'price-conscious' in this sense."

"To what do you attribute this popular recognition, Mr. Edgar?" asked the ELECTRICAL WORLD editor. "It would be a mistake to overemphasize this change of feeling or, rather, growth of understanding by the public," replied the head of the Boston company. "The public relations work of the industry has been far-reaching, and the reiteration of the significance of the price trend in light and power circles is bearing fruit. Within the industry it is well known that we are continually striving to produce, transmit and distribute energy at lower over-all costs. Success here enables operating companies to institute rates which encourage greater use of service. Slowly but certainly the public is coming to appreciate that while the light and power stockholder's investment is entitled to a return which will attract new money for the upbuilding of the business, after all proper costs and charges are met and a surplus provided against future needs, wise management is striving to achieve rate levels that will develop volume business, whether in the home or in the factory. Of course this cannot be accomplished in a day, but the trend is toward a time when unfair attacks upon rates will be less frequent."

Mr. Edgar's attention was then called to the many problems of post-war readjustment which all industries have had to grapple with, and he was asked how the light and power companies of New England have been able to meet these conditions. Turning to his questioner, he said: "By taking advantage of improvements in equipment, by interconnection on a widening scale, by economies in operation, load building, prudent financing, and through the more skillful and analytical planning of system development savings have been made and business increased very substantially on leading New England properties. The policy of centralized operation has gained further headway, both in singly managed and grouped systems. The volume of service to the public represented in present energy sales and the increased amount of wholesale power blocks marketed regionally over intercompany tie lines indicate that comparatively speaking we are in an era of electrical mass production and distribution. This means that we can well afford to utilize the most advanced engineering ideas, support vigorous commercial policies, co-operate with other branches of the electrical industry to stabilize and safeguard profits, back up sound educational programs for employees, maintain more valuable contacts with other industries and in many cases play a valuable part in what might be called corporate community citizenship. New England utilities have been on the alert, for the most

part, in making use of progressive ideas. Some companies have pioneered developments which are already making history, and interest is widespread in the results of such advanced installations as the high-pressure steam units at our own latest station and the mercury boiler and turbine application at Hartford."

"Mr. Edgar," said the representative of the ELECTRICAL WORLD, "has hydro-electric development in New England in any way threatened the basic value of steam plants of large capacity in this territory? Is there any reason to expect that steam plant development will cease to maintain its key position here as interconnections with distant waterpowers grow in number and transmitting capacity?" "We have in New England," was the answer, "an unusually good instance of the advantageous working together of both steam and hydro plants. For many years the public overestimated the value of water powers, but intelligent popular opinion today grasps the fact that many of these represent larger outlays per kilowatt of rating than do the later steam stations.

STEAM AND HYDRO CO-ORDINATED

"The readers of the ELECTRICAL WORLD appreciate the economic benefits of interconnections between steam and hydro plants, and these need not be repeated. General statements of the value of water and steam plants carry little weight, but the system interconnections which have grown up in the past decade or so have added to the economic position of the tidewater steam stations of New England. Secondary hydro power has found a wide market when brought into the urban system load centers. Problems of interoperation have been many, but these are being attacked by engineers with good results. Taking the two kinds of plants together, it is a fair statement that thus far many economies have been reaped in this region from their association, and we may expect more to follow. Unquestionably some steam plant expansion has been postponed on account of hydro interconnections, but I am sure that we shall continue to purchase fuel-burning apparatus for large-scale electric generation.

"Present-day improvements in equipment and in methods," said Mr. Edgar, "proceed with a clear vision of our over-all cost responsibilities. In New England, as elsewhere in the United States, we are confronted with the necessity of working the invested dollar harder. Progress is apparent in many fields of load building from the home to the industrial plant. It is safe to say that through electric refrigeration, cooking, better lighting and in many other ways the average annual energy consumption of the home in New England will make great gains over present figures within the next few years, even as the present consumption much exceeds that of pre-war days. I doubt if many New England companies sold over 250 to 300 kw.-hr. per home per year before 1920, whereas today quite a number have reached 400 or over and 500 does not appear far off as a base, and in fact will become common as the full drawing power of promotional type rates becomes felt. This whole question of utilizing our capital investment more effectively is a very large subject. It receives constant study, and every diversified application of electricity that is established promotes it. It is intimately related to commercial activity, and New England's progress in industrial lighting, industrial electric heating, more efficient applications of electric power in old and new installations during the past seven years has been made in full recognition of the industry's investment responsibility."

"In connection with these improved methods," asked the ELECTRICAL WORLD man, "the question has arisen as to whether the property under holding company operation has an advantage over the singly managed company. I do not suppose the question can be answered categorically, but I think it would be helpful if you would say a word on this." "It is a question of methods rather than who applies them," said Mr. Edgar. "It is apparent that small, independent properties run under a considerable handicap, although public relations are good in many of these and some are doing an excellent job in the distribution field. The trend is toward centralization in management, but we obtain this on some of our larger singly run properties scarcely less than in holding company groups. The Edison company of Boston developed its present system by acquiring a large number of small suburban properties, shutting down wasteful generating stations and co-ordinating them with the metropolitan organization. Both types of property are illustrated in successful management. It is sometimes overlooked that there is an interchange of ideas and experiences throughout the electrical industry that is not confined to holding companies or to so-called independent properties, and it might be correct to say that the future depends more upon the quality of management rendered than upon ownership. So far as the public is concerned, a certain decentralization of company administrative functions will be necessary regardless of developments in ownership, in order to maintain understanding and friendly relations with localities and their individual interests. It is obvious that where securities can be bought and sold in the open market, properties may change owners. Many such changes have featured electrical development in New England since the war, and no one but a prophet can foretell how far this movement will go. In New England you can point to excellent relations between properties of each type."

AN OPEN BOOK POLICY

"Could you not fairly say, Mr. Edgar," was the final question, "that the open book, as it were, of the light and power companies' policies and the desire of company managements to help build up prosperity in New England through every reasonable form of co-operation have powerfully influenced the successful development of the industry in these past few years? In other words, is not the effort to render public service in the best sense of the word fundamental? "It should not be necessary," said Mr. Edgar, "to elaborate this. It is simply fundamental to modern ideals of public service to build up friendship between ourselves and our customers by rendering the best service we can at reasonable rates. If the industry as a whole in New England had not done this in the past few years, it would have lost a large proportion of its business. A major reason for establishing the Boston Edison radio station, WEEI, was to build popular friendship. In all our activities, from serving the rural customer at the end of a costly line extension to co-operation with the New England Council in its constructive work for the development of these six states, from serving metropolitan industries to supporting worthy industry organizations, the utilities of this section are working in the open, and have long done so. The past seven years have been marked by many technical advances, but none has been of greater import than the quickening sense of responsibility among ourselves, our customers and the public in general which has yielded so much good."

Birmingham is typical of a rapidly growing industrial city of the South

The Interconnected South

Industrial renascence of the South makes for wealth and social progress. The big five program gets results. Electric power the keynote of success

By L. W. W. Morrow
Managing Editor

THE renascence of the South is the most eventful happening of current American progress. This region lay prostrate for 40 years following the Civil War and upward of 8,000,000 discouraged young men left the South to seek their fortunes in a more favorable environment. What has happened to awaken the South and to make it the land of promise for American business executives? Why has the value of manufactured products increased in the South from $1,394,316,000 in 1910 to $4,754,824,000 in 1926? Why is the rate of industrial and commercial growth in the South greater than in any other region in America and why has the social progress of this region kept pace with its industrial achievements?

The traditional South is advancing one and one-half times faster than the country as a whole, according to a recent survey of the Department of Commerce. It has led the nation in industrial and commercial growth during the last twelve years and the basic factors for this growth are given as electric power, agriculture, mining, forestry and manufacturing, together with the fact that it is a region favored with splendid topography, a good climate, many natural resources, an abundance of raw materials, an ample labor supply and is near enormous domestic and export markets. Very largely it is a case of capital and industry going to power and labor under favorable taxation conditions.

About 1910 the South found the big five program which it follows today and the practical application of this program has brought about the astonishing progress of recent years. The big five program is the co-ordinated and active development of

1. Electric power.
2. Educational facilities.
3. Good roads.
4. Manufacturing industries
5. Diversified agriculture.

It is not exaggeration to say that the renascence of the South is largely a byproduct of technical electrical progress. Through the pioneering efforts of the utilities electric power was made available in all sections of the region and this power has brought industry to the workers and has made possible social progress.

Electricity completely reverses the older process of taking the worker to the power. Few students of industrial civilization realize that the steam engine age of power has gone and that no longer is it necessary to have congested cities, enormous factories and concentrations of mechanical power in one locality in order to obtain economic industrial development. Electricity can rush with the speed of light to the place it is needed, and through the most extensive and complete interconnected transmission system in the world the old South has co-ordinated its fuel and hydro power resources and sent them forth to diversify industry, to attract new industries and to raise the standards of comfort on the farm and in the home.

Electric power has been made ready for the industrial South. In case of need electricity can be relayed from Tennessee and Alabama to eastern North Carolina or Virginia, 600 miles distant, or power can be relayed from West Virginia to Alabama and Mississippi. Complete flexibility in transmission has been developed and the co-ordinated resources of the utilities are placed in service in any locality as needed to meet economic conditions. The waterpower installations aggregate more than 4,000,000 hp., and it is estimated that more than 3,000,000 hp. in new water-power installations will be added to meet the power demands of 1933. Added to this is an equal amount of fuel-burning station capacity so that the combined fuel and hydro power installations are expected to aggregate more than 12,000,000 hp. by 1933. In 1928 the nine Southern states listed in accompanying tables had 1,291 operating light and power companies with an aggregate generating capacity of 4,241,000 kva.

The waters on the eastern slope of the Appalachians and those of the western slope have been harnessed to the fuels of West Virginia, Kentucky and northern Alabama to afford an economical and flexible power supply to a region which has just awakened to its future despite the rapid growth of the past few years.

Utility executives in the South had the vision and courage to build this interconnected system to bring to the South new industries to use the power available. They went to industrial centers to sell the South, they worked with Southern town officials to show them how to build up their communities by co-operating in an industrial program and in many instances they went so far as to invest their money in new business enterprises. A romance in utility pioneering could be written of the South, and when recent history is recorded it will be found that the cornerstone of the new South was the initiative, faith and ability of these utility executives.

Good roads in the South have called for about $400,000,000 a year for several years and these roads have helped to change the entire agricultural and industrial situation. Farmers can market their crops and can get ready money by helping to build the roads; each town and city is accessible to workers who dwell in the rural areas and tourists now drive South in winter to add new money and to bring new business. Good roads have brought about accessibility and have developed a community of interest in co-operative projects for the benefit of the states.

Education has had a revival in the South in marked degree. Leaders of the South based their program for progress on the development of a sound educational system, and in most of the states today public schools and colleges are found that are well conducted and supported. Education has become a paying commercial project as well as a desirable cultural development.

Basic Resources of South

Down through the Appalachian mountains and their foothills, extending from Pennsylvania to Alabama, lies the manufacturing region of the South. The mineral deposits, the raw materials, the best labor supply and the most favorable geological and geographical conditions are found in this area.

The leading manufacturing industries in the South are lumber, textile, furniture, iron and steel, quarries, tobacco and cement. A wave of popularity for textile manufacturing has resulted in the location of 18,399,832 cotton spindles in the South, compared to a U. S. total of 36,494,496 in 1928. In 1927 the South had a net increase of 502,210 spindles and the other states had a net decrease of 1,372,444 spindles. These spindles in the South work more spindle hours per year than those in other areas because statistics show that Southern mills, with 50.42 per cent of the spindles, worked 65 per cent of the total spindle-hours recorded in 1927. These textile mills are scattered over the Piedmont region of the South, where good labor is available and where climatic conditions are splendid. Many rayon mills are being built in this region to take advantage of these conditions.

In the Birmingham district the South has developed large metal, electrochemical and coal mining industries. The Tennessee Coal & Iron Company has very large metal-producing and coke-producing works near Birmingham and many allied types of industries have been constructed in this region because iron ore deposits, coal beds, shale deposits and limestone deposits are found. Cement mills and fertilizer plants occur in numbers and

Energy Generated Increased 50 per Cent in Four Years Thousands of Kw.-Hr.

	1924	1925	1926	1927
Virginia	743,668	801,568	925,882	1,099,000
West Virginia	1,762,737	1,642,894	1,807,360	2,143,000
North Carolina	647,330	942,294	1,117,378	1,324,000
South Carolina	943,577	881,536	1,038,198	1,232,000
Georgia	748,756	660,790	710,578	845,000
Florida	218,288	318,134	509,670	605,000
Tennessee	694,073	874,973	894,015	1,030,000
Alabama	890,087	1,169,101	1,582,717	1,822,000
Mississippi	74,216	90,927	58,667	67,000
	6,722,732	7,382,217	8,644,465	10,167,000

Number of Customers in South Increased 30 per Cent in Four Years

	1924	1925	1926	1927
Virginia	134,965	153,455	182,450	199,900
West Virginia	118,553	131,088	141,528	152,500
North Carolina	164,439	180,059	195,600	209,500
South Carolina	94,291	98,641	106,000	114,200
Georgia	127,193	138,135	154,200	168,700
Florida	143,676	156,800	180,000	181,800
Tennessee	167,050	180,704	192,000	206,900
Alabama	103,149	131,450	150,900	168,400
Mississippi	55,158	56,830	60,300	65,300
	1,108,474	1,227,162	1,362,978	1,467,200

diversified manufacturing is very evident in central Alabama.

In western North Carolina near High Point one of the largest furniture manufacturing areas is now found. Southwest Virginia, southern West Virginia and western Tennessee are witnessing a very rapid growth of manufacturing, textile, electrometallurgical and electrochemical plants predominating. The Aluminum Company of America has large plants at Badin, N. C., and Alcoa, Tenn., and is enlarging its production facilities in the South. Many Southern manufacturing plants have been the result of local enterprise, but in a number of instances industries have been brought to the region solely because the industrial departments of the electric utilities have gone to manufacturing centers and brought new industries to the South. The genius of James B. Duke started the early development of textile and tobacco manufacturing in the Carolinas and many other utility executives likewise adopted a very aggressive industrial policy.

In the Kanawha Valley of West Virginia a large electrochemical and electrometallurgical industry has sprung into being and in eastern Tennessee rayon and textile manufacturing is growing fast. The ample power resources and the stable and competent native white labor combine with climate, natural resources and transportation facilities to make this region the center of this type of manufacturing.

Between the foothills and the coastal plain lies a very fertile agricultural area where diversified agriculture, dairying, fruit growing and other industries are very promising under the new conditions, and down in the coastal plain lies a fertile belt for forest products, agriculture and manufacturing which can use negro labor to advantage. Almost any climate and any environment can be selected in the South to suit the business of any prospect and it is astonishing to find that these possibilities were unrecognized a dozen years ago.

Cotton is still king in the South, but the center of cotton growing is shifting to Texas and Oklahoma and more diversified agriculture is taking place in the old South. In south Georgia peaches and pecans predominate, in north Georgia apples are grown in large quantities. In Florida the citrus fruits of the lake regions will soon be challenged by the vegetable products of the truck gardens in the reclaimed Everglades. In the black hills of Alabama and Georgia the dairy industry is developing and in northern Florida, the Carolinas and other states general agriculture is being developed with crop diversification as the keynote to progress. The farm crops of the South in 1926 were worth $1,522,000,000.

In agriculture, as in manufacturing, the influence of electric power is felt decisively. Rural lines are built in all sections and a reliable source of electricity is available in nearly every village and cross-roads community. The farmhouse will soon be made comfortable with light, telephone and electric appliances and many electric ranges and water heaters are used. Co-operative work is going on in all states to bring the electric motor to do the work of the farm. Electric power, good roads and good rural schools keep competent farmers on their farms.

The South of today is capitalizing on the errors made in earlier industrial developments. It is rapidly proving that decentralized industries lend themselves more effectively to the economies of mass production than congested areas with enormous factories. Electric power, raw materials, a small plant and a small town with surrounding farms to feed the workers are proving to be a better industrial and social arrangement than any heretofore established. The South is finding the answer to the mechanization of civilization.

The light and power industry in the South has entered upon a new period of development. The rather small scale operations of local utilities are replaced by very large scale operations wherein multiple hydro and steam stations are tied to widely extended transmission systems. Along with this physical property development is the growth of a load-building and industrial policy whereby the utilities use every effort to bring new industries into the territory and to develop existing industries.

Fortunately these transitions were easy and logical, for they followed hard on the growth of local hydro-electric properties which were interconnected with adjacent utilities. The utilities of the South started largely as hydro properties serving distant cities over transmission lines. Because of the variable water flow in most Southern rivers the interconnection of utilities was a self-evident service insurance and was used as normal practice. The grouping together of utilities under one management and the co-ordinated use of steam and hydro stations was a logical step to take in the further electrical development of the territory. Today finds the South largely served by the following utilities:

Southeastern Power & Light Company.
Carolina Power & Light Company.
Duke Power Company.
Florida Power & Light Company.
Tennessee Electric Power Company.
Appalachian Power Company.
Virginia Public Service Company.

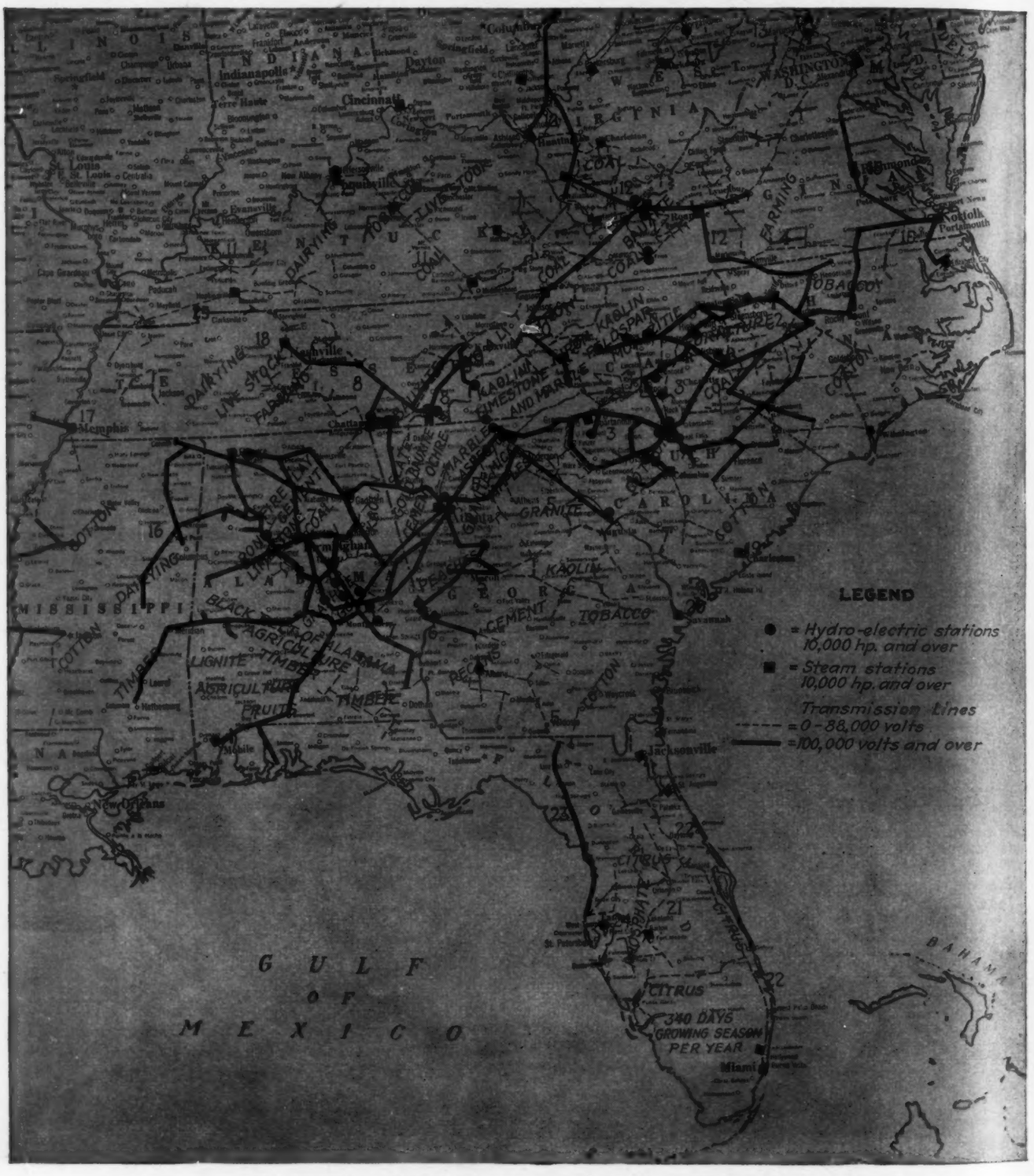
There is a very interesting interconnection between utilities in the Carolina region. The Duke Power Company has hydro plants along the Catawba River and several steam stations. The Carolina Power & Light Company has hydro stations on the Yadkin, a large steam

*Economic Progress of the South**

	1910	1926
Population	16,483,725	20,306,000
Property value, dollars.	16,004,001,000	32,458,643,000
Manufacturers:		
Capital, dollars	1,438,858,000	4,225,000,000
Value of products, dollars	1,394,316,000	4,754,824,000
Mines, Quarries, Wells:		
Capital, dollars	434,241,000	795,368,016
Value of products, dollars	136,328,000	425,160,000
Cotton Manufacturing:		
Capital, dollars	344,754,000	797,950,000
Value of products, dollars	229,529,000	886,573,000
Furniture products, value	10,160,000	93,650,000
Value of farm land	2,519,782,000	3,958,586,000
Bank deposits	650,282,000	3,017,737,000
Motor vehicles, number	66,765	2,506,198

*States of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia. Based on *Census and Manufacturers' Record* data.

Electric Power Is Available to Develop All the Resources of the South



PRINCIPAL OPERATING UTILITIES IN THE SOUTHEAST

1. Tidewater Power Company.
2. Carolina Power & Light Company.
3. Duke Power Company.
4. Virginia Public Service Company.
5. Georgia Power Company.
6. Columbus Electric & Power Company.
7. Alabama Power Company.
8. Tennessee Electric Power Company.
9. Knoxville Power Company.
10. Tennessee Public Service Company.
11. Kentucky Utilities Company.
12. Appalachian Electric Power Company.
13. Monongahela West Penn Public Service Company.
14. Potomac Edison Company.
15. Virginia Electric & Power Company.
16. Mississippi Power Company.
17. Memphis Power & Light Company.
18. Nashville Power & Light Company.
19. South Carolina Power Company.
20. Savannah Electric Company.
21. Florida Public Service Company.
22. Florida Power Company.
23. West Florida Power Company.
24. Tampa Electric Company.
25. Louisville Gas & Electric Company.

plant at Cape Fear and small hydro steam plants near Asheville. The Tallahassee Power Company has hydro plants on the upper Yadkin which largely supply energy to the Aluminum Company at Badin. On the north the Carolina Power & Light Company has an interconnection with the Appalachian Power Company, which in turn has a connection with the Tennessee Public Service Company, which in turn interconnects with the Asheville-Carolina system.

By means of these interconnections many emergency and normal energy interchanges occur. This winter, when extremely cold weather limited the capacity of hydro plants at Asheville, energy was relayed from the Raleigh property via the Appalachian Power Company and the Tennessee Public Service Company. This enabled Asheville to carry its load without curtailment.

Again, the Pigeon River hydro project under way near Asheville will deliver a large block of energy to the northern part of the Duke Power system. This system will deliver an equal amount to the Carolina Power & Light system at Wateree, in the southeastern part of the state. Both systems will get needed energy from nearest generating sources to load areas which require the energy. Again, the Carolina Power & Light and Duke Power systems deliver energy to the Tallahassee Power Company to operate the Aluminum Company plants at certain periods and the Tallahassee Power Company returns energy from its hydro plants at other periods, depending upon load and water conditions. Again, it is possible to interchange energy with the Tennessee Public Service Company, the Georgia Power Company and the Appalachian Power Company at intervals, depending upon load and water conditions.

The Southeastern Power & Light Company is the most widely extended transmission system in the South. It operates in Mississippi, Georgia, Alabama, Florida and South Carolina. The larger operating subsidiaries are the Alabama Power Company, the Georgia Power Company and the Mississippi Power Company. The grouping of these properties under one management has been followed by an extension of lines to small towns and rural areas and by aggressive load-building efforts. The co-ordinated operation of many lines and plants has brought about many operating economies and improved service conditions.

For many years the major utilities in Georgia remained in the larger cities and used transmission lines to interconnect with utilities in neighboring states. But at present a rapid integration is occurring whereby the large systems are extending into adjacent territories. The Georgia Power Company has expanded very rapidly since it became part of the Southeastern Power & Light Company and has extended south and east.

Growth of Typical Carolina Utilities

Duke Power Company:	1921	1927
Total generating capacity, kva	280,900	902,395
Circuit-miles of high-tension line	2,143	3,803
Kilowatt-hours generated	834,300,000	1,750,000,000
Population of territory served	1,650,000	2,000,000
Carolina Power & Light Company:		
Total generating capacity, kw	34,525	84,710
Kilowatt-hours generated	150,854,366	426,425,000
Miles of high-tension line	606	1,820
Number of electric customers	25,347	63,102
Miles of distribution line	470	1,565

Georgia in the north has coal and mineral deposits, including the famous marble quarries. In the central part of the state peaches, pecans and general farming predominate and the coastal plain is suited for timber and general farming. The peach and pecan business has grown by leaps and bounds and apples are being grown in large quantities in the north. The mineral deposits of Georgia are being investigated and a brick and clay industry is also growing rapidly in the central part of the state.

Georgia utilities in the past have relied very largely on water power and still do because of major interconnections. The Georgia Power Company is linked with the Alabama Power Company at several points, making it convenient to use fuel energy from Alabama and even Tennessee when economical. Atlanta is the chief city on this system and a center of utility activity. This city is a manufacturing and wholesale outlet of the South and is growing rapidly.

Typical Towns on Carolina Power & Light Company System

1. **Oxford, N. C.**—A town served for many years which has a competing gas company. It has 724 residential customers and 70 ranges are served.

	1921	1927	Per Cent Increase
Kilowatt-hours sold to lighting customers	254,414	447,525	76
Kilwatt-hours sold to power customers	809,740	1,863,343	130
Kilowatt-hours sold for heating and cooking	66,116	100,279	51
Number of street lights	55	61	10
Gross merchandise sales, dollars	8,655	10,447	21
Total number of customers	957	1,131	18.2
Estimated population	4,100	6,000	47
Miles of distribution line	17.6	22.2	21

2. **Hamlet, N. C.**—A town served for many years. Railroad junction with railroad shops. It has 897 residential customers and 176 ranges are served.

	1921	1927	Per Cent Increase
Kilowatt-hours sold to lighting customers	353,874	563,669	60
Kilowatt-hours sold to power customers	2,360,991	3,650,784	57
Kilowatt-hours sold for heating and cooking	222,692	323,394	45
Number of street lights	131	187	42
Gross merchandise sales, dollars	9,714	10,994	13
Total number of customers	1,059	1,391	31
Estimated population	6,100	6,800	11.5
Miles of distribution line	19.5	27.7	42

3. **Hartsville, S. C.**—Industrial and residential town purchased in 1921. Notable increase in business followed as a result of the service and merchandising efforts of the Carolina Light & Power Company organization.

	1921	1927	Per Cent Increase
Kilowatt-hours sold to lighting customers	218,487	454,582	108
Kilowatt-hours sold to power customers	6,163,554	12,149,852	97
Kilowatt-hours sold for heating and cooking	61,038	222,788	264
Number of street lights	104	177	70
Gross merchandise sales, dollars	7,211	17,166	138
Total number of customers	659	1,231	87
Estimated population	4,100	4,700	14.6
Miles of distribution line	12.7	49.1	286

Growth of Georgia Utilities

Georgia Power Company:	1921	1927
Generating capacity, kw.	106,200	219,098
Energy generated, kw.-hr.	246,440,991	329,829,017
Energy purchased, kw.-hr.	35,643,976	367,477,871
Total system energy, kw.-hr.	282,084,977	697,306,888
Miles of transmission line	354.75	916.48
Miles of high-tension distribution	330.01	1,341.14
Number of electric customers	33,222	83,637
Population served	730,000	1,550,000
Columbus Electric & Power Company:		
Generating capacity, kw.	32,200	62,255
Energy generated, kw.-hr.	92,763,490	223,597,126
Miles of transmission line	60.0	176.2
Number of customers	6,267	9,900
Population served	134,350	84,467

Merchandise Sales per Customer on Georgia Power Company System

	Electric	Gas
1925	$4.76	$5.31
1926	10.73	5.92
1927	15.27	6.09

At Columbus the Columbus Electric Company has hydro stations and interconnections with adjacent utilities. It has an extensive transmission system to serve agricultural towns in the southern part of the state. Several textile plants have been located in this region and this industry is growing.

Fourteen years ago the Alabama Power Company had five power customers who had a connected load of 6,000 hp. During 1927 this company operated generating stations with an aggregate capacity of 490,000 kw. and sold more than 1,400,000,000 kw.-hr. to customers.

This growth is typical of Alabama in late years. Coal in the north, iron and limestone in the central portion, fine agricultural lands, low taxes and good labor combined with electric power to build the state very rapidly. More than 2,000,000 tons of iron ore and 6,000,000 tons of coke produced in 1927 attest the size of this industry. Add the cement, coal mining, lumber, electrochemical and textile industries to the pool and it is seen that Alabama rightly can be proud of its accomplishments.

Birmingham is called the Pittsburgh of the South and the records of the Birmingham Electric Company prove that it has had an astonishing growth in the few years of its existence. Montgomery, Anniston and other interior cities have likewise grown rapidly and the development of the port facilities in Mobile bid fair to bring an export outlet of manufactured products which will make Mobile an outstanding city.

Raw materials and natural resources in themselves did not make Alabama growth. The electric utilities developed water and steam power, sent their lines out across the state and then went into the industrial centers of the country and sold their territory and facilities to industrial executives. For 1927 alone the Alabama Power Company secured new industries for the state which will add 30,000 people and $15,000,000 new capital spent for construction to the assets of the state.

There were 1,587,842 cotton spindles in Alabama on Jan. 31, 1928, and many new textile plants are contemplated in the near future because of the efforts of the Alabama Power Company in co-operation with Alabama towns.

Florida has not been injured by the collapse of the boom. This state still has its timber, phosphate, agriculture, fruits and warm sunshine. The tourist crop of 1927-28 was splendid and Florida is equipped to entertain winter tourists properly, thanks to the boom. Hotels are splendid and people with means flocked to the resorts to enjoy the sunshine and recreation facilities.

Central Florida is developing a splendid citrus fruit industry. In the Everglades five truck crops a year are luring gardeners to the region. Near Tampa the phosphate deposits afford a stable industry and in northern Florida general farming, lumber and fishing are splendid assets. The basic soundness of Florida is unaffected by the rise and fall of real estate speculators.

The Florida Power & Light system extends along the east coast and across the country to the west coast to Fort Myers and other towns. It serves 112 communities and 115,000 customers. It was put together in 1925 by closing down many small plants and connecting together these towns by transmission lines, so that today three efficient power stations do the work of nearly a hundred inefficient stations. This company is building its territory even to the extent of establishing an experimental farm in the Everglades. Properly developed, the Everglades will use about 1 kw. per acre for trucking and the utility is doing more than its share in bringing this garden spot into cultivation.

At Tampa the Tampa Electric Company has a very stable load because of the industries in and near that city, especially the phosphate industry and the tobacco industry. This utility reports very good conditions. In the citrus regions near Orlando the Florida Public Service Company has built a splendid system which supplies light and power to a large area from a modern system.

Alabama Power Company Grows Rapidly

	1921	1927
Installed capacity, kw.	191,675	490,051
Circuit-miles of transmission lines	563	1,255
Miles of distribution lines	989	2,763
Number of customers	17,967	67,084
Energy generated, kw.-hr.	429,110,700	864,958,000
Energy purchased, kw.-hr.	3,878,600	445,083,150

Energy Sales Data of Alabama Power Company

Year	Number of Wholesale Customers	Number of Retail Customers	Total Energy Sales, Kw.-Hr.
1921	159	18,000	370,470,000
1922	...	20,000	511,914,000
1923	...	35,000	627,584,000
1924	...	40,000	680,718,000
1925	...	51,000	918,535,000
1926	...	63,000	1,173,013,000
1927	478	88,270	1,470,836,000

NOTE—Montgomery was acquired in 1923 and Mobile in 1927. The system was extended into outlying territory during the period covered in the data.

Classified Energy Sales of Alabama Power Company

Year	Wholesale, Kw.-Hr.	Retail, Kw.-Hr.
1921	356,901,000	13,568,000
1922	496,877,000	15,036,000
1923	601,524,000	26,060,000
1924	645,679,000	35,038,000
1925	875,671,000	42,861,000
1926	1,121,943,000	51,070,000
1927	1,373,430,000	97,406,000

Data on Florida Utilities

Florida Public Service Company:	1924	1927
Generating capacity, kw	3,935	31,350
Energy generated, kw.-hr	6,930,000	19,685,239
Miles of transmission	.....	374.1
Number of customers, electric	3,098	14,388
Population served	40,000	89,000
Florida Power & Light Company:	**1925**	**1927**
Number of customers	68,817	99,776
Generating capacity, kw	69,513	138,031
Miles of transmission	232	1,158

In northern Florida two municipal plants serve Tallahassee and Jacksonville and the Florida Power Company has built an extensive system from near St. Petersburg north to Jasper, where it interconnects with Georgia-Alabama Power Company systems. The Gulf Power Company serves 9,000 customers in Pensacola and thirteen towns in the surrounding territory and is interconnected with the utilities of the Southwestern Power & Light group.

Conditions in Tennessee

On the western side of the mountains the Tennessee Electric Power Company operates a large system which has been influential in developing the industrial assets of middle and eastern Tennessee. In Memphis, Knoxville, Nashville, Bristol and other towns local utilities are alert to every opportunity to get industries to locate on their lines and the executives devote major attention to local building.

Practically all of the industrial development of Tennessee during recent years has been in the territory served by power lines. During the last five years Tennessee, in keeping with the rest of the South, has secured a share of the textile mill business that has been moving away from New England and has developed local plants. These textile mills have all located in the

Need More Publicity —Not Less

By P. S. Arkwright
President Georgia Power Company

IF THERE is one outstanding lesson to be learned from the present investigation of the electric light and power industry by the Federal Trade Commission it is this—not that we should curtail or cease our public relations and educational work, but that we should increase it, expand it, and carry it forward with greater vigor.

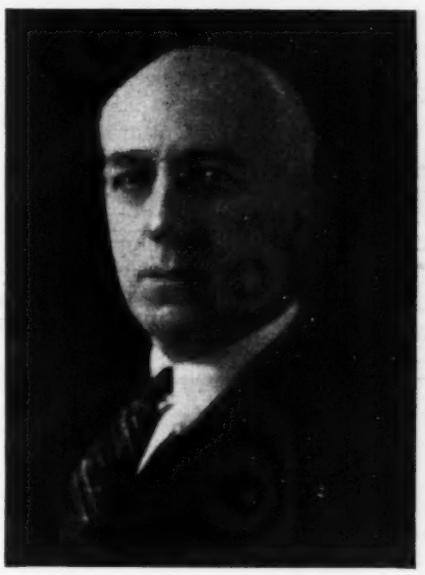
It is upon this phase of our work that the attention of the commission has so far been centered, and we have been charged in the sensational press with "polluting the stream of education," with wholesale "corruption of editors and legislators" and with other grand and petty crimes too numerous to mention.

The very fact of these extravagant charges, the unrestraint with which the propagandists for government ownership have sought to give the color of corruption to entirely innocent acts, the complete and utter baselessness of many of the charges are all the proof we need that greater educational work must be done.

We have always been the target of the demagogue. Perhaps we always will be, no matter how we conduct ourselves. Perhaps we should take comfort in the fact that we are better off than we used to be, that our opponents now are forced to base their charges upon actions which further, cooler consideration will show to be blameless.

But events of the recent past have shown how much we have yet to do before the public at large learns to know and really to understand our business, our aims, our purposes, how vital it is to the public itself that private initiative in this industry be preserved, how harmful it is to the public itself when we are saddled with unjust tax burdens and subjected unjustly to political attack.

Our public relations work is a young activity, scarcely



P. S. Arkwright

ten years old in the majority of our companies and still lacking entirely in some of them. If it has overstepped the bounds of right or decency in any case, we want to know about it more than any one else, so that we can correct the defects and raise the work to a still higher plane, but I do not believe this will prove to be true except perhaps in minor instances. I am confident that the commission will find what we already know to be true, that our public relations work is not only a legitimate activity but that it has benefited the public as much as if not more than it has benefited the industry.

Our public relations work has accomplished much in a short period of time in bringing about a sounder understanding and a pleasanter relationship between the public utilities and the public, and I believe that the public is better pleased and better served because of it. But there is still a great and an important work to be done, and I am confident that we, as an association and as individual companies, will go forward with it, undaunted.

territory that is served by adequate power systems.

In the wake of industrial progress has come increased commercial activity in the large and small communities of the state alike. New hotels, stores and other commercial establishments have been opened or are under construction in many small towns, showing that the decentralization of industry, effected by the widespread transmission of power, is affecting other social and commercial elements in the economic life of these communities.

In the territory of the Memphis Power & Light Company there has been a steady growth. In 1921 there were 426 industrial plants in Memphis, but in 1927 the number had increased to 606. Nashville, Knoxville, Bristol and other Tennessee cities record similar or greater industrial developments and have a notable reputation as progressive and rapidly growing cities with alert utilities serving them and helping them grow.

Virginia Utilities Expanding

Virginia has been the scene of large utility consolidations in recent years. About Newport News developments have occurred whereby transmission interconnections are had with the Carolinas. Norfolk and Richmond have had a splendid growth and in the Shenandoah Valley and in the southwest small cities have been tied together to give extensive transmission systems, which in turn have brought about rapid industrial developments. While largely an agricultural state, Virginia has splendid assets for industrial developments on the coast and in the foothills of the Appalachian Mountains. A good roads program is under way and co-operative efforts are being made to develop the state in every possible manner.

Data on some typical Virginia utilities give a picture of the conditions which give promise of a prosperous future for the "Mother of Presidents." One of the new consolidations has been brought about by the Virginia Public Service Company.

Growth of Tennessee Electric Power Company

	1921	1927
Kilowatt-hours generated	342,948,926	651,397,468
Installed generating capacity, kva	137,490	265,050
Miles of steel tower line, single circuit	353.54	489.83
Miles of wood-pole line, single circuit	179.15	313.24
Number of customers served	45,464	91,259
Population served	440,000	500,000

In the year 1921, for the territory exclusive of Newport News, the generation was approximately 35,000,000 kw.-hr. In 1927 it exceeded 80,000,000 kw.-hr. The length of transmission lines in service at the close of 1927 was approximately 700 miles. In 1927 the number of customers was approximately 48,000 and the population of the towns served approximately 200,000.

The American Gas & Electric Company purchased some time ago the properties of the American Electric Power Company of Philadelphia, including the Roanoke Railway & Electric Company, the Lynchburg Traction & Light Company and the Consolidated Light & Power Company of Huntington, W. Va. About the same time it also acquired the old Appalachian Power Company of Bluefield, W. Va., and the Virginian Power Company of Charleston, W. Va. All of the electric lighting and power properties in these groups were merged into a new company, the Appalachian Electric Power Company, a Virginia corporation.

The following data cover operations in Virginia only:

	1921	1927
Kilowatt-hours generated	50,643,000	73,536,000
Generating capacity, kilowatts	14,000	20,500
Miles single circuit transmission lines	26	304
Number customers	17,000	26,500
Estimated population served	85,000	122,500

The small and overloaded local stations in this territory have been supplanted by an unlimited and dependable source of power supply received over 132-kv. transmission lines supplied by large modern and efficient generating plants, thereby affording an unlimited and dependable supply of electric power to the communities in this territory.

In southern West Virginia and eastern Kentucky rapid growth has been made since 1921. All the American Gas & Electric properties are connected together with high-voltage lines and interconnections of the American Gas & Electric system are had with the Carolina Power & Light Company at Danville, Va., with the Tennessee Public Service Company at Kingsport, Tenn., and through an interconnection with the Consolidation Coal Company the two Kentucky properties are tied together.

Mine Load Predominates in Coal Regions

In the coal field areas electric power has been applied successfully to mining and some of the fields are completely electrified. Because of ample and low cost electric power mining companies can operate at any desirable location and many have increased production and lowered costs by using electrical mining equipments and methods.

In the Kanawha Valley near Charleston several large electrochemical and chemical plants have been built in recent years and afford the utility a splendid load. In some of these plants where process steam is used the industrial plants are interconnected to the utility system. Near Huntington the International Nickel Company has a very large plant and the future for these regions looks very bright to utility executives.

In the northern part of West Virginia the West Penn system gives an interconnection from the Pittsburgh area to eastern Pennsylvania. Water-power plants and fuel-burning stations are combined with transmission lines to give power in this large area, where coal and other resources are found in abundance. Diversified manufacturing is coming into being very rapidly in the West Penn territory.

Still a Virgin Industrial Region

The South fairly hums with activity. Every utility is alert to build load and sends men to all parts of the country to sell industry the advantages of locating in its territory. Every barometer shows that the South is still a virgin region for commercial, agricultural and industrial growth. Yet it has gained national recognition for its possibilities at last and expects to capitalize on this recognition as soon as possible. In the front ranks of the aggressive leadership of the new South are found the group of energetic utility executives who are ready to reap the rewards deserved by those who have labored under the heart-breaking handicaps of past years. If Horace Greeley were alive today he would say, "Go South, young man." An electric spark has fired the South to build a new civilization.

Latest addition to the chain of Bear River hydro-electric plants

Pioneering with Electricity

Colorado, Utah and California characterized by hydro-electric development and high-voltage transmission. Customer ownership, irrigation pumping, oil field and mine electrification also are important

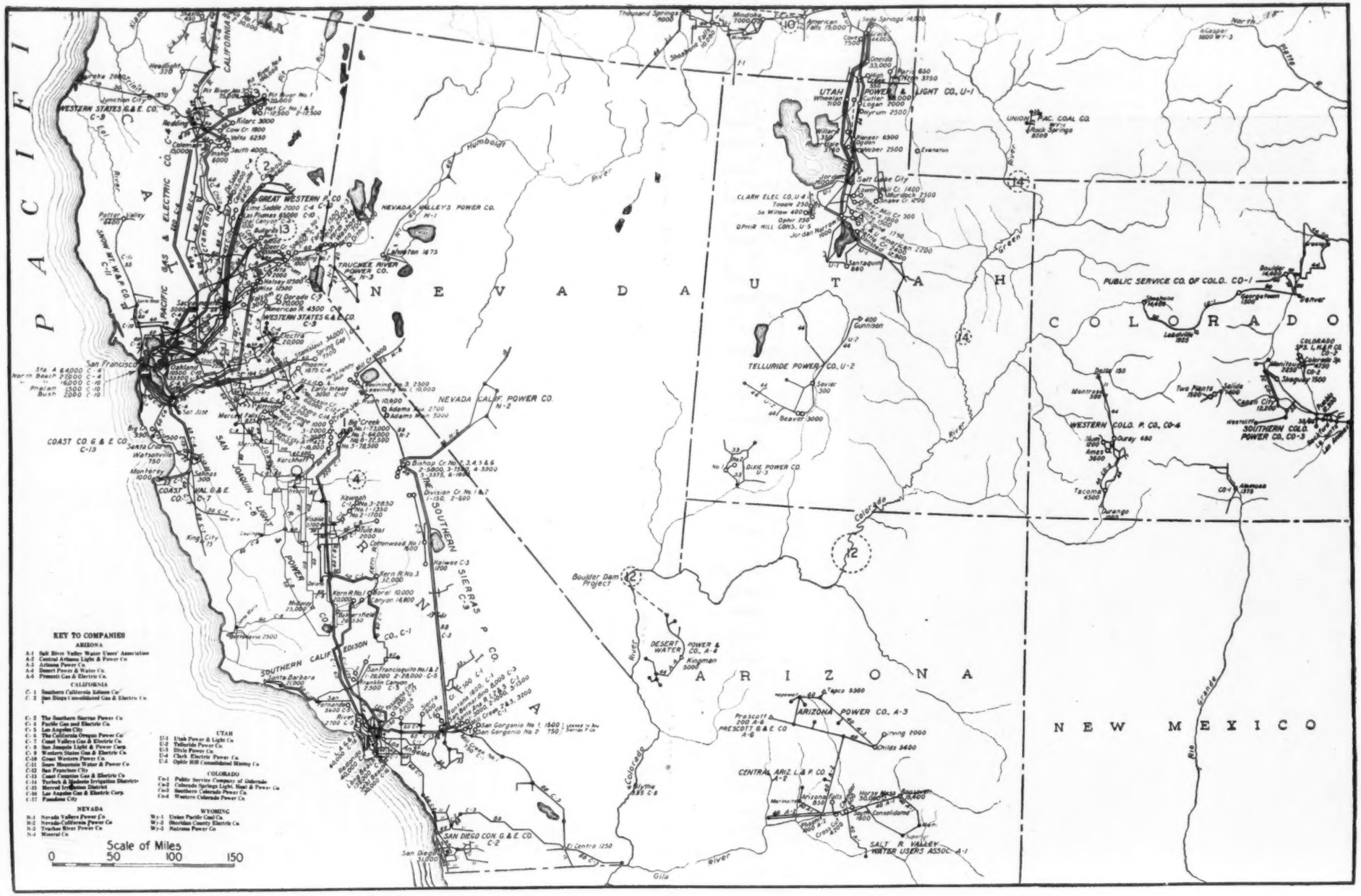
By WALTER C. HESTON
Pacific Coast Editor

DEVELOPMENT of large blocks of hydro-electric power in the high mountain regions of Colorado, Utah and California and transmission of this power over long distances at voltages ranging from 110,000 to 220,000 has meant conservation of water power and has brought about a degree of electrification exceeded by few sections of the country.

Remoteness of water powers from load centers early led to a solution of the engineering and operating problems incident to high-voltage transmission and a constant increase in transmission voltages has resulted. Today there is in operation in California more than a thousand miles of 220,000-volt lines. Five years of operation at 220 kv. by the Southern California Edison Company and the Pacific Gas & Electric Company has demonstrated the thorough practicability and dependability of high transmission voltage. Power from the Big Creek plants of the Edison company amounting to 258,000 kw. is transmitted to Los Angeles, a distance of 240 miles, over two 220-kv. lines and by the middle of the year 90,000 kw. from Big Creek No. 2-A plant will be added, at which time a third 220-kv. line will be placed in operation. Pit River power totaling 176,000 kw. is transmitted to the San Francisco Bay region by the Pacific Gas & Electric Company at similar voltage. The Great Western Power Company has 100 miles of 220-kv. line, at present operating at 165 kv., which interconnects its system with that of the San Joaquin Light & Power Corporation and will add an additional 80 miles of line to operate at 220 kv. to its system by the middle of the year.

In Utah the Utah Power & Light Company transmits 135,000 kw. from its hydro plants in northern Utah and southern Idaho to Salt Lake City at 130 kv., a distance of approximately 130 miles. The Public Service Company of Colorado has a 90-kv., 150-mile transmission line crossing the Continental Divide several times which delivers the output of the 15,000-kw. Shoshone plant to Denver. The 349-mile, 88-kv. line of the Southern Sierras Power Company between its Owens River plants and San Bernardino, Calif., is notable for its length, but cannot be considered as transmitting power from one extremity to the other.

With this brief mention of some of the most important transmission lines of the West and a study of the accompanying transmission map it will be evident that



Pacific Coast noted for high-voltage transmission and hydro development

the populous sections of Colorado, Utah, Arizona and California are interlaced with a maze of transmission lines.

The policy of hydro-electric development and long-distance transmission followed by the utilities of this section over a long period of years has had a far-reaching effect upon development of the territory. It has enabled rural communities and practically every small city and town to enjoy full benefits of electric service and has been responsible for development of the "back country" upon which the larger cities must depend largely for their prosperity. With trunk transmission lines passing through the valleys it has been possible for the power companies to tap the lines at large load centers, from

California Enters Commercial Era

By A. F. Hockenbeamer
President Pacific Gas & Electric Company

ELECTRIC utilities of California entered the year 1928 with an ample supply of power for all needs; in fact, more kilowatt-hours are available today to serve the rapidly growing needs of the state than ever before in the history of the industry. On their financial side credit was never better. Their stocks were never in greater demand nor more widely owned. Their bonds never commanded a higher price in the financial markets. Money on good terms is available for whatever expansion may be ahead and for refinancing old obligations where they can be retired with advantage.

It is not expected, however, that on the whole building programs of utilities will equal those of the period of 1920 to 1925. This was a period of unusual construction activity to catch up with work necessarily postponed during the war, or stimulated by the unusual business expansion which followed the war. Utilities of California were back to normal by 1926 and the year just closed was likewise one of normal activity, of consolidation and co-ordination and of welding together existing properties. Several important mergers were effected in the interest of economy and efficiency. Within a comparatively few years the Pacific Gas & Electric Company has through absorption of fourteen smaller companies abolished the management staffs and management fees of these companies and saved a total sum for the benefit of its consumers approximating the total of the salaries at present paid to its own executive staff.

Economy and efficiency in operation was the goal of utilities in 1927 and the year closed with excellent records of operating economies by the larger utilities. There were many rate reductions during the year as a result of these economies, some of them amounting to 10 per cent or more. It is confidently anticipated that the recovery of the revenue lost by reason of these reductions will be greatly accelerated by the inducements for greater usage offered under the lower rates.

The light and power industry of California enters the year 1928 with the greatest commercial development program before it in its history. New business activities will be confined largely to increasing consumption of existing customers rather than extension into new territory. This follows from the fact that 92 per cent of all potential residential customers in the state are now served and that 62,000 California farms, or 45 per cent of the total, now enjoy the benefits of light and power service. My own company will spend at the annual rate of $1,000,000 for development of new business during 1928 and expects to add a load of 115,000 kw. That this

A. F. Hockenbeamer

program is proving highly successful is shown by the fact that during March 7,791 hp. of new business in household appliances alone was added to our lines. This represents the greatest increase in this class of business in any one month in the history of the company. Reports coming from other power companies of the state indicate similar success in their load-building efforts, and 1928 without doubt will be one of noteworthy commercial achievement.

The customer-ownership plan which originated in California still goes ahead apace. Today there are approximately 175,000 customer owners in the state, or an increase of 133 per cent over the number five years ago. This movement, originally intended to raise money for new construction, has also demonstrated its value in creating more friendly relations between the utility and its customers through making them partners in the business. The widespread ownership of stock under this plan is shown by the fact that there are only two stockholders of Pacific Gas & Electric stock that hold more than 1 per cent of the outstanding stock, and the aggregate holding of these two is only 6 per cent.

Presidential years have come to be looked upon as unsettled, but in so far as the utilities of California are concerned they apparently have no reason to fear such years. In fact, the last two Presidential years witnessed as large a growth as in other years and the Pacific Gas & Electric Company actually had a larger annual growth in these years than in any that preceded them.

The utilities of California face 1928 with conservative optimism; they enjoy good public relations, and confidently expect sound growth and development in the industry.

Table I—Central-Station Customers in Six Western States, Showing Increase During Five- and Ten-Year Period

	Total Central-Station Customers			Domestic Lighting Customers			Commercial Lighting Customers			Power and Other Customers		
	1917	1922	1927	1922	1927	Increase	1922	1927	Increase	1922	1927	Increase
California	619,803	1,018,222	1,672,100	745,980	1,335,900	589,920	172,750	181,850	9,100	66,610	154,350	87,740
Arizona	24,370	38,552	43,480	21,580	35,700	14,120	2,750	5,660	2,910	750	2,120	1,370
Nevada	11,495	11,008	17,600	11,490	13,730	2,240	1,900	3,400	1,500	350	470	120
Utah	.....	81,940	119,300	70,130	104,600	34,470	9,860	11,450	1,590	1,950	3,250	1,300
Colorado	92,242	132,708	204,500	125,210	169,000	43,790	17,240	26,250	9,010	6,400	9,250	2,850
New Mexico	13,988	18,834	27,050	17,490	22,540	5,050	2,960	3,410	450	610	1,100	490
Total for six states	.....	1,301,264	2,084,030	991,880	1,681,470	689,590	207,460	232,020	24,560	76,670	170,540	93,870

which distribution lines are extended, in turn, to industries and farms that otherwise could never have been reached.

Interconnection

Had the situation which exists today with reference to the relative economy of steam versus hydro-electric generation existed ten to fifteen years ago much of this hydro-electric development and most of this transmission network might have come more slowly. However, under the program pursued not only have the benefits mentioned accrued but extensive interconnection of systems has resulted, until today all of the major utilities of California are interconnected. Several of the Arizona properties are linked and the system of the Utah Power & Light is tied in with that of the Idaho Power Company.

These interconnections fall into three general classes: Those for standby or emergency service only, those for straight wholesaling of power from one utility to another in one direction only and those for interchange of power between systems to enable the most economical over-all operation of the two. In the latter class the most notable interconnection anywhere in the West is that between the Great Western Power Company and the San Joaquin Light & Power Corporation. These two systems were connected by a 100-mile, 220-kv. line between Sacramento and Merced, Calif., two years ago, and since that time there has been a free interchange of power which has not only enabled utilization of available water supply to the best possible advantage but has added to reliability of service as well. During the spring of 1927, when there was an over-supply of power available from stream flow plants on the San Joaquin system, a 66,000-kw. plant of the Great Western Power Company on the Feather River was completely shut down for a period of more than a month and the water that would have been required for the plant was stored in Lake Almanor, a 1,300,000-acre-ft. storage reservoir, for use later in the season when power would be needed on the San Joaquin system. During this period the interconnecting line, which for the present is operating at 165 kv., carried as high as 75,000 kw.

As time goes on more interconnections of this type will be made as economies of a given situation dictate. Although, as previously stated, the power systems of California are practically all interconnected, these interconnections are largely for wholesaling of power in one direction only or for emergency purposes. In the latter category they have been invaluable on more than one occasion, notably that of the power shortage in 1924 due to an abnormally dry year. During the period of this shortage 12,000 kw. of steam power in the San Francisco Bay region was transferred through three systems a distance of approximately 500 miles and made available in the vicinity of Los Angeles to help relieve the situation where the shortage was most acute. Steam power from San Diego also was transmitted over interconnecting lines to the Los Angeles region.

With higher steam plant efficiencies, low price of fuels and lowering steam plant construction costs, steam electric generation is rapidly increasing, particularly in southern California and Colorado. The ratio of steam to total generating capacity (Table II) of the Southern California Edison Company has increased from 49.5 in 1922 to 75 in 1927. This company has embarked upon a steam plant construction program which will further increase this ratio as units are added in a third plant at Long Beach which ultimately will have a capacity of

Table II—System Data for Six California Power Companies Showing Growt

	Pacific Gas & Electric Company		Southern California Edison Company		San Joaquin Light & Power Corporation	
	1922	1927	1922	1927	1922	1927
Installed hydro capacity (kw.)	417,828*	621,213*	194,300	347,600	78,210	112,9
Installed steam capacity (kw.)	173,592*	206,266*	96,220	261,600	52,000	52,0
Per cent steam of total capacity	29	25	49.5	75	40	
Total yearly generation	1,608,941,000†	2,094,880,000†	1,131,518,000	2,419,530,000	451,173,000	504,431,0
Total yearly hydro-generation	1,120,762,000	1,484,414,000	1,058,700,000	2,168,000,000	379,800,000	499,132,0
Total yearly steam generation	251,724,000	15,567,000	72,818,000	241,530,000	71,373,000	5,299,0
Per cent steam to total generation	18.3	1.03	6.88	11.15	15.8	1.0
System peak (kw.)	393,710	423,403	239,160	448,900	67,885	128,8
Electric energy sales (kw.-hr.)	1,098,000,000	1,657,965,000	901,784,091	1,877,000,000	370,384,000	576,142,0
Total system investment	$118,500,000	$200,000,000	$136,000,000	$276,000,000	$51,887,000	$70,665,0
Miles high-tension transmission	2,954	3,240	1,550	2,242	1,086	1,3
Miles distribution	7,356	10,426	7,093	9,258	3,266	6,1
Population of territory served	1,500,000	1,860,000	1,700,000	2,600,000	302,000	312,0

*Horsepower. †Includes purchased power. Note—Any apparent discrepancies between kilowatt-hour sold and total generation are due

Table III—Gross Revenue, Customers and Range Data for 1927, Showing Growth During Past Five Years

	Electric Gross Revenue	Total Electric Customers	Total Residential Customers	Per Domestic Customer: Average Revenue	Per Domestic Customer: Average Kw.-Hr. per Year	No. Electric Ranges Served	Per Cent Range Saturation
Pacific Gas & Electric Co.	$33,880,000	506,987	342,332†	$28.49†	502†	14,943	4.4
Southern California Edison Co.	30,297,697	376,312	312,267	24.22	456	12,241	3.9
Los Angeles Gas & Electric Corp.	6,991,927	142,843	115,518	22.97	453	.....	....
Utah Power & Light Co.	9,710,601	98,746	83,167	25.35	358	11,223	13.5
San Joaquin Light & Power Corp.	8,539,215	74,665	49,904	33.42	625	3,406	6.8
San Diego Cons. Gas & Electric Co.	3,971,736	64,165	.....	.....	...	1,556	....
Great Western Power Co.	8,699,709	56,580	44,095†	29.80†	682†	4,802	10.9
Central Arizona Light & Power Co.	1,347,093	15,076	12,532	30.84	440	469	3.7
Totals	$103,437,978	1,335,374	959,815	$27.87	502	48,640	7.2
Percentage increase for five-year period, 1922–1927	59	71	73*	17.5*	6.4*	290	....

*Based on all companies excepting San Diego Consolidated Gas & Electric and Great Western Power Company. †Approximate.

720,000 kw. The first unit in this plant, which will have a capacity of 90,000 kw. and an economy of approximately 14,000 B.t.u. per kilowatt-hour, will be placed in operation in June of this year. Seven other units of similar capacity will be added as demands on the plant require.

The Great Western Power Company has under construction a steam plant in San Francisco which will have an initial capacity of 35,000 kw., the Pacific Gas & Electric Company is building a new steam plant in Oakland which will add 37,500 kva. of steam capacity to its system, the Los Angeles Gas & Electric Company is adding a second 43,750-kva. unit to its Seal Beach steam plant and the San Diego Consolidated Gas & Electric Company is adding a 25,000-kva. unit to its San Diego plant. Thus it will be seen that steam is destined to play a more and more important part in future power development in California.

System Growth

Several of the California utilities have shown phenomenal growth during the past five years, as will be seen from Table II. Of the six companies for which data are given the Los Angeles Gas & Electric Corporation has shown the greatest growth with an increase in generating capacity of 158 per cent and in output of 166 per cent, and this is in spite of competition with the Los Angeles municipal system. The Southern California Edison Company has shown the remarkable increase in generating capacity of 110 per cent and in generation of 114 per cent, or an increase of more than 20 per cent a year over the post five-year period. In the intermountain region—a section growing less rapidly than California in population and industrial development—the Utah Power & Light Company has shown an increase in generating capacity of 56 per cent and in output of 44 per cent, or approximately 10 per cent per year.

To provide for rapidly increasing demands for electric service the six California utility systems given in Table II required an increase in generating capacity of 58 per cent, or 630,000 kw., during the past five years, or an average of 116,000 kw. per year. At an average of $150 per kilowatt for both steam and hydro this means that $17,400,000 of new capital is required each year for plant investment alone, and assuming that $400 per kilowatt is required for transmission and distribution, an additional capital outlay of $46,400,000 is needed. Allowing for several smaller companies not included, approximately $75,000,000 of new money all told is required each year.

Customer Ownership

Approximately $15,000,000 of this new money is raised each year through the sale of securities to customers in the territories served. The origination of the customer-ownership idea is credited to A. F. Hockenbeamer, now president of the Pacific Gas & Electric Company, who in 1914 conceived the idea of junior financing through direct sale of stock to the company's patrons. The movement spread rapidly after 1917, when it was taken up by the Southern California Edison Company, and today there are approximately 175,000 individual stockholders among the customers served by California utilities, holding a quarter of a billion dollars of utility securities.

The number of customer owners of utilities in the Southwest has grown rapidly. During the past five-year period there was an increase of 132 per cent in the number of stockholders. The Southern California Edison Company has by far the greatest number of customer owners of any Western utility, having at the close of the year 1927 102,000 customer owners. By May 1, 1928, this number had been increased to 117,000.

At its inception the customer-ownership idea had as its primary object the raising of money for capital expenditures at a time when money was difficult to obtain.

During the Past Five Years

Great Western Power Company 1922	Great Western Power Company 1927	Los Angeles Gas & Electric Corporation 1922	Los Angeles Gas & Electric Corporation 1927	San Diego Consolidated Gas & Electric Company 1922	San Diego Consolidated Gas & Electric Company 1927
114,400	133,000	None	None	None	None
31,400	31,400	42,000	108,700	31,200	46,000
22	19	100	100	100	100
555,143,000	673,336,000	92,940,000	247,142,000	47,390,000	109,945,000
540,374,000	666,598,000	.....	.....	.....	.....
14,769,000	6,738,000	92,940,000	247,142,000	47,390,000	109,945,000
2.7	1.0	100	100	100	100
.....	136,300	32,100	74,000	17,900	34,300
409,800,000	543,669,000	80,168,000	203,340,000	52,854,000	106,490,000
383,345,000	$107,194,000	$10,854,000	$34,677,000	$8,900,000	$17,200,000
531	717	None	24	90	119
.....	2,532	870	1,407	780	1,221
.....	1,100,000	840,000	1,300,000	143,000	224,000

purchase of power.

That the plan did serve this purpose is evident from the widespread sale of stock. However, during the post-war period, when the money market had eased up and public confidence in the light and power industry had made it possible to secure capital in large amounts and at reasonable rates, the customer-ownership movement began to take on a different aspect, that of improving public relations in individual communities served. Today this is the primary object of nearly all customer-ownership activities. Without doubt the widespread and diversified holdings of utility securities has been responsible for a degree of public confidence in the utilities that serve them that could not have been brought about in any other way. Without doubt, too, it has been instrumental in the defeat of many pernicious public-ownership schemes proposed, particularly the thrice defeated water and power act of California.

Agricultural Development

Irrigation pumping as a basic agricultural load has brought about widespread use of electricity on the farm in the great valleys of California, the region around Phœnix, Ariz., and in the great Salt Lake basin of Utah. Probably the first electric motor installation for irrigation pumping was made near Visalia, Calif., in 1899 by A. G. Wishon, now president of the San Joaquin Light & Power Corporation. Mr. Wishon had the vision to see the possibilities of developing a profitable pumping load and building a central-station load in a territory where there was little central station business in sight by fostering agricultural development, which would in turn bring more people and industries for his company to serve. The original rate made for pumping in the San Joaquin Valley was $50 a horsepower year and through a liberal extension policy the load has grown until today 31 per cent of the company's gross revenue and 31.4 per cent of its energy sales come from agricultural business. More than 12,000 pumping plants having a connected load of 136,178 hp., or 35 per cent of the motor load of the system, are now served. Important agricultural and pumping loads also are served by the Pacific Gas & Electric Company, Great Western Power Company and Southern California Edison Company.

The extent to which California farms are electrified is shown by a recent survey made by the California Committee on the Relation of Electricity to Agriculture. This survey shows that on the basis of 128,000 farms in California, as indicated by the 1920 census, 51,000 farms, or 40 per cent, were receiving electric service in 1925, the latest year for which figures are available. These farms had a connected power load of 635,913 hp. and consumed for power only 712,947,487 kw.-hr., which produced a gross revenue of $11,010,694. The average connected power load per customer was 15.77 hp., the average annual consumption 17,652 kw.-hr., average annual revenue $273.08 and the average rate paid per kilowatt-hour 1.54 cents. The large pumping load served by California power companies has been responsible for high system load factors and in most cases summer instead of winter peaks.

Mine and Oil Field Electrification

Extensive coal and mineral mining operations in Colorado, Utah, New Mexico, Arizona and Nevada are practically all carried on with electric power. Probably not more than half of the power utilized is supplied by central stations due to the remoteness of the mines from transmission lines. The most notable case of utilization of central station power in mining operations in this region is that of the Utah Copper Company, near Salt Lake City, where the Utah Power & Light Company supplies all of the electrical energy used on the property. This and other mining loads served by the Utah Power & Light Company used 429,000,000 kw.-hr. in 1927, which was 65 per cent of the company's total electric energy sales. The high load factor of the mining load was largely responsible for a system load factor of 75.5 per cent for the year 1927.

In the large copper mines of Arizona, at Jerome, Globe, Miami, Bisbee, Ajo and the smelting center at Douglas, practically no central-station power is utilized, although mining, hoisting and refining are largely done electrically. As the territory develops and transmission lines are extended central-station power will be utilized to a greater extent to supply requirements over and above the capacity of the present isolated plants. Already the lines of the Salt River Valley Water Users' Association are connected to the system of the Inspiration Copper Mining Company at Inspiration and a line is now under construction which will tie in the Arizona Power Company with the plant of the United Verde Copper Company at Clarkdale.

One of the pioneer pumping installations in the oil fields of California was that made at Coalinga in 1909 on the system of the San Joaquin Light & Power Corporation. In 1913 the first electric drilling operation took place in the same territory. A great deal of effort has been devoted by the San Joaquin Light & Power Corporation to developing the oil field load and the success of this effort is evident from the fact that the company now serves an oil field load of 25,000 kw. and during 1927 its energy sales to this class of business amounted to 73,706,532 kw.-hr., or 13 per cent of its total energy sales. Oil fields of southern California also are extensively electrified, some of them completely and some only partially. Much of the pumping is still done with natural gas engines, but with the increasing market and rising price of natural gas, oil-producing companies are finding it more economical to sell their gas and utilize electric power for pumping. The economies of electric drilling as compared with steam or gas are so great as practically to preclude the latter forms of power in future drilling operations.

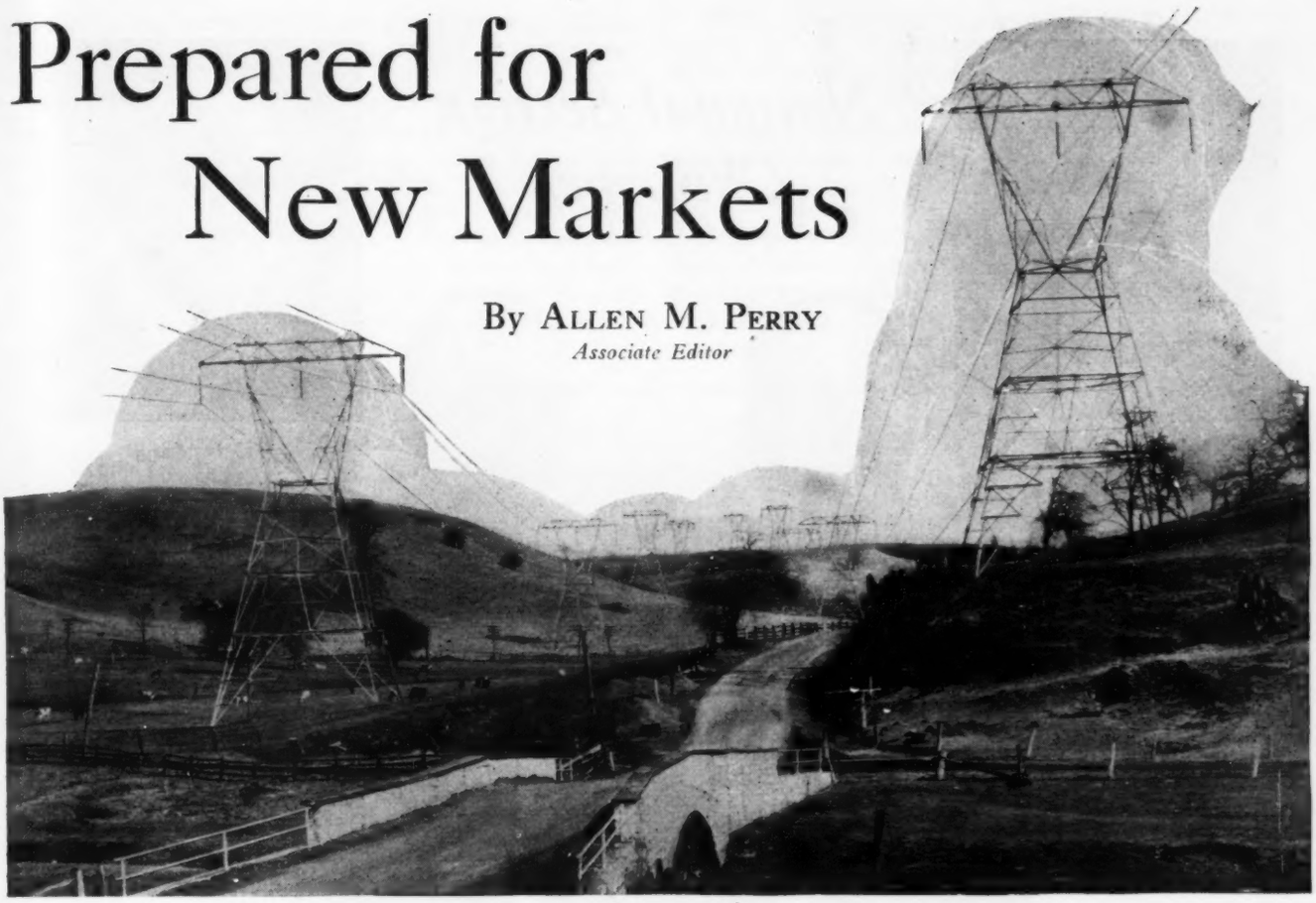
Domestic Load Building

In their efforts to secure business the power companies of the Southwest have not concentrated on domestic load building to the same extent as their neighbors in the Northwest. As far as coverage of their territory is concerned the Utah Power & Light Company and the utilities of California have done a particularly good job. The Utah company serves 98 per cent of the available domestic customers in its territory, while 92 per cent of all potential residential customers in the state of California are served by the electric light and power companies.

Until recently few companies had intensively cultivated the domestic field. Within the past two years, however, there has been a general commercial awakening, and with only two or three exceptions every power company in Colorado, Utah, New Mexico, Arizona, Nevada and California is now engaged in an intensive commercial development program, with particular emphasis on the domestic customer. Already these effects are showing promising results and the next five-year period will see an increase of at least 50 per cent in domestic consumption.

Prepared for New Markets

By ALLEN M. PERRY
Associate Editor



Dense population and proximity of good-sized cities and towns to one another in the Middle Atlantic States, together with their highly industrialized territory, have brought interconnection and development on a large scale, chief interest now centering in maintenance of service and development of future markets

WITHIN the three Middle Atlantic States of New York, New Jersey and Pennsylvania there are more than 400 cities having a population of 5,000 or more, 233 with 10,000 or more and 44 with 50,000 inhabitants or more. With such nuclei for load centers and state populations averaging no lower than 207 persons per square mile in Pennsylvania and as high as 426 per square mile in New Jersey, there has not been the economic difficulty, which some sections have experienced, in spreading out systems, interconnecting and consolidating.

Such populous centers as New York, Philadelphia, Pittsburgh, Buffalo and Newark, with their concentrated domestic populations and commercial and industrial loads, have exacted very reliable service and called for the building of large, efficient generating stations, large load-center substations and high-density distribution systems.

Superposed over and interposed between these aggregations of human beings who make up the domestic load and justify commercial loads is a tremendous industrial market composed in 1925 of approximately 60,000 establishments using 10,000,000 hp. to turn out yearly products valued at close to $20,000,000,000. There are more than 33,000 of these establishments in New York State and more than 17,000 in Pennsylvania.

Delaware and Maryland are not so populated or industrialized, having jointly only ten cities with populations of 5,000 or more and 3,603 industrial establishments. Nevertheless, these states generated 583 and 437 kw.-hr. per capita respectively in 1927, compared with 1,025 kw.-hr. and 795 kw.-hr. for New York and Pennsylvania.

Faced with these opportunities for business and the economic possibilities of extending their systems, electric utilities in this territory early stimulated extensive utilization of purchased energy. When the World War broke out and this territory became the scene of unprecedented industrial and commercial activity many industries changed to purchased power. Demands were made on utilities that severely taxed their capacity for service and probably urged interconnections forward as much as anything.

Relief came during the adjustment period after the armistice and for several years utilities rehabilitated plants which had operated with virtually no maintenance for several years and installed much needed new generating capacity. The high unit costs at which these additional generating facilities had to be installed urged commercial departments to greater efforts. The extended taste of purchased power, the vigorous efforts to acquire new business and returning prosperity of a different order eventually called for more generating equipment and interconnections. Consolidations of the smaller properties into the larger ones became more numerous, and holding companies sought to increase their financial credit and hence their capacity for carrying on developments by extending and diversifying their holdings. Finally, the

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plentiful money market of the last few years arrived that has permitted refinancing as well as raising of new capital at lower rates.

Despite the existence of Niagara Falls power in this territory and the recent completion of the Conowingo and Wallenpaupack hydro developments, steam power still predominates in the proportion of 68 to 32. Among the important steam stations built in the last six years were East River, Kearny, Hudson Avenue, Charles R. Huntley, Gould Street, Binghamton, Richmond, Delaware, Deepwater, Whippany, Pine Grove, Shippingport and Saxton.

Interconnection of adjacent systems and plants has grown apace, as the accompanying transmission maps and table of inter-system ties indicate. Networks have been developed that tie together practically every system within the states considered and even connect the group with outside territories that are just as extensively interconnected. For example, there is a tie with the New England Power system on the northeast through the Mohawk-Hudson Power system. On the northwest the Buffalo, Niagara & Eastern Corporation is tied in with the Hydro-Electric Power Commission of Ontario. On the west the West Penn Power Company is interconnected with the Ohio Power Company.

The inter-system interconnections within this territory, while requiring that the systems operate in parallel, do not permit bulk transmission of energy from one end of the interconnected network to the other. However, non-adjacent systems have been able to exchange energy by load displacement in the intervening systems.

A few examples of heavy ties between adjacent systems do exist like those between the Hydro-Electric Power Commission of Ontario and the Buffalo, Niagara & Eastern Corporation, or the more recent 220-kv. tie connecting the Pennsylvania Power & Light Company, the Philadelphia Electric Company and the Public Service Electric & Gas Company. But even these ties exist chiefly for adjacent system interchange.

Interconnection between stations of the same system or affiliated companies range from loose ties (having capacity sufficient to offset loss of local reserve) to trunk-line ties the equivalent of a station bus. Probably the outstanding example of the latter type is the 132-kv. trunk between the Public Service Electric & Gas Company's Marion, Kearny and Essex stations, all within a stretch of about 3 miles. While ranking large in capacity, the ties between Canada, Niagara Falls and Buffalo and between the New York stations could hardly be considered as solid ties as the one in New Jersey. Brooklyn affords an example of large generating units paralleled only through substations, while Baltimore does likewise with its two generating stations.

Backbone transmission lines of the order of 110 kv. are evident in most of the Eastern systems that serve long narrow strips of territory like the Niagara, Lockport & Ontario Company and the Mohawk-Hudson Power Corporation. But they serve chiefly as transfer buses between separated generating stations and make power available where there may be inadequacies or loss of reserve. For such service multiple circuits are employed, in some cases over separate right-of-way.

Loop transmission lines of a similar order of voltage are used or are being favored by companies wherever their territory is adaptable to this method. They are also used around the outskirts of cities to provide reliable service to industries, raise the limits to loads which can be taken on and avoid radial feeds from generating stations to these industries as well as outlying residential sections.

Loops exist around the Buffalo-Niagara district and Pittsburgh. They have been started around the north of

Some Major Interconnections in Middle Atlantic States

This shows that directly or indirectly all of the companies listed (with exceptions of Nos. 8 and 10), are connected with each other and with New England, Canada and Ohio, and therefore operate in parallel, although interconnections are used only to exchange power with adjacent systems.

Co. No.	Name	Buffalo, Niagara Eastern	Philadelphia Electric	West Penn	Public Service	Duquesne	Mohawk-Hudson	Pa. Pwr. & Lt.	Cons. Gas (Baltimore)	Pa.-N. J.	Pa. Water & Power	Penn-Ohio	Penn Public Service	Northern N. Y.	Rochester Gas & Electric	Central Hudson	Penn Central Light & Power	N. J. Central	N. Y. State Gas & Electric	Co. No.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	Buffalo, Niagara & Eastern*				●		●						●	●	●					1
2	Philadelphia Electric				●			●												2
3	West Penn Power†					●							●				●			3
4	Public Service Electric & Gas		●					●		●								●		4
5	Duquesne Light			●								●								5
6	Mohawk-Hudson Power‡	●												●		●			●	6
7	Pa. Power & Light		●		●					●										7
8	Consol. Gas, Elec. Lt. & Pwr.										●									8
9	Pa.-N. J. Power				●			●								●				9
10	Pa. Water & Power								●											10
11	Pa.-Ohio Power					●														11
12	Penn Public Service	●		●													●			12
13	Northern N. Y. Utilities	●					●													13
14	Rochester Gas & Electric	●																		14
15	Central Hudson Gas & Electric						●			●										15
16	Penn Central Light & Power¶			●									●							16
17	N. J. Central				●															17
18	N. Y. State Gas & Electric						●													18

*Tied with Hydro Electric Power Commission of Ontario.
†Tied with Ohio Power Company.
‡Tied with New England Power.
¶Tied with Potomac Public Service & Keystone Power Corp.

Baltimore, the congested industrial district of New Jersey and are being considered on the eastern end of the Mohawk-Hudson system. The Penn Central Light & Power Company is an example of a company serving separated industrials through looped circuits. At points around the Duquesne loop as well as the New Jersey loop are tap substations from which lines run to load-center substations within the loop.

Interconnection arose as an opportunity for making the best use of investment in generating plants in adjacent districts. But it was soon observed that the most flexible utilization of interconnections could not be obtained under separate ownerships, as complicated contractual agreements and differing engineering practices often hampered operations and parties to the interconnections were chiefly interested in how they could benefit individually rather than in how the best use could be made of the entire interconnected capacity. As a consequence, consolidations of adjacent properties under the same financial ownership sprang up, giving a community of interest and purpose.

In such consolidations were also seen the opportunity to enhance financial credit standing, make purchases in bulk, avoid widely differing engineering and commercial practices, provide engineering and commercial staffs which smaller components could not support alone, simplify accounting and reports to government and commissions, reduce total overhead administration expense, smooth out demands on construction forces, etc.

In New York State the Mohawk-Hudson Power Corporation is well on the road to co-ordinating diverse interests and practices from Albany north and west through Utica and Syracuse. The Buffalo, Niagara & Eastern Corporation has well in hand the unification of service in the northwest part of the state from Buffalo and Niagara Falls east along the southern shore of Lake Ontario. A billion dollar merger involving the Brooklyn Edison Company and Consolidated Gas group of properties in New York City has at last been ratified.

The major changes in Pennsylvania have included bringing the Philadelphia Electric into one United Gas Improvement family, the Duquesne Light Company into the Byllesby group and the Penn Central Light & Power Company under Insull interests. The West Penn Power Company is developing and expanding service to the multiplicity of towns surrounding the Duquesne Light territory, which runs northwest and southeast through Pittsburgh.

The Consolidated Gas, Electric Light & Power Company, serving Baltimore and surrounding territory, still remains independent, although it has been rumored that a large holding company is seeking control.

As a recent example of what consolidation can do, the Mohawk-Hudson Power Corporation is typical. Only a few years ago the 27 or 28 plants that now constitute this system were divided among five major companies and a number of smaller properties. Water-power rights and different frequencies and voltages hindered the best use of these properties even after attempts at interconnection. Now the parent company, through providing a mutual financial interest, is fast removing barriers to unified operation, co-ordinating operation for best system results, eliminating diverse engineering practices where feasible, harmonizing water-power utilization with outside interests and avoiding sharp differences in handling customers of the component companies. This company is still in the transitory stage.

Because of the previous affiliations of the Niagara Falls Power Company, Buffalo General Electric Company, Niagara, Lockport & Ontario Company and other subsidiaries, the Buffalo, Niagara & Eastern Company, which was formed as a holding company just a few years ago, has been able to make very rapid strides toward simplification of its corporate and financial structures. Already it has exchanged holding company common stock for practically all of the outstanding common stock of its

Some Significant Measures of Development and Increased Value t

(Based on Repo

	Duquesne Light Co.		Public Serv. El. & Gas		Penn Cent. Lt. & Pwr.		Brooklyn Edison	
	1927	1921	1927	1921	1927	1921	1927	192
Operating ratio	46.8	58.1	63.7	69.3	42.4	59.5	66.5	71
Taxes: government, state, municipal (000 omitted)	$1,814	$745	[7]$5,636	[7]$2,610	$251	$94	$4,700	$1,3
Number of employees	2,660	1,690	5,700	3,900	813	398	9,400	3,5
Salaries and wages (000 omitted)	$5,100	$2,800	$12,000	$6,700	$1,484	$619	$14,686	$5,4
Total gen., kva	451,800	285,850	624,432	293,755	96,875	34,375	476,500	189,7
Largest single gen., kva	47,100	47,100	44,444	35,300	37,500	10,000	88,900	30,0
Largest single station, kva	308,800	140,600	215,588	90,500	62,500	21,250	276,400	108,5
Maximum transmission voltage	66,000	66,000	132,000	26,400	45,000	45,000	27,000	13,6
Transmission miles	[1]932	[1]530	1,287	947	492	260	485	4
Construction budgets (000 omitted)	$13,940	$9,655	[8]$18,151	[8]$4,758	$1,398	.....	.....	.....
Pounds of coal per kw.-hr	.....	.....	1.514	2.235	1.418	2.204	1.46	2.
System losses	8.6	25	15.8	15.5	15.2	17.8	15.4	
Domestic customers	[2]135,868	.....	657,232	179,010	[2]19,471	.....	[2]471,000	.....
Kilowatt-hours per domestic customer	637	453	[9]628	[9]506	[11]511	[11]374	320	3
Merchandise sales per domestic customer	$4.26	$3.53	$4.09	$5.32	$4.46	$4.91	$1.06	$1.
Per cent of industrial plants on purchased power	88.9	73.8	98	94	92	66	96	
Per cent of industrial horsepower on purchased power	[3]42.5	[6]26.7	64	43	.....	.....	.....	.....
Kilowatt-hours sold (000 omitted):								
Domestic	144,617	41,546	} 413,246	} [10]147,821	18,186	6,324	202,439	52,3
Commercial	[4]135,677	[4]70,026			12,521	5,002	276,816	128,0
Industrial	[5]865,113	[5]513,367	770,756	[10]257,874	148,787	56,769	275,380	144,4
Number of isolated plants displaced since 1921	157	.....	200	.....	.....	.....	.....	.....

[1]Circuit-miles.
[2]Added since 1921.
[3]65 per cent exclusive of waste heat users.
[4]Retail.
[5]Wholesale and other utilities.
[6]45 per cent exclusive of waste heat users.
[7]Electrical department only.
[8]Fixed capital increase.
[9]Ten typical houses.
[10]Exclusive of railways.
[11]Blair County only.
[12]All departments.
[13]Dec. average consumption.
[14]Purchases majority of power; generati capacity only for reserve.

Middle Atlantic Utility Groups Rank High in Output

Rank Compared with Other Utilities in Country, 1927	Name of Utility or Group	State	Output, Million Kw.-Hr., 1927	1921
1	Buffalo, Niagara & Eastern...	N. Y.	4,634	[1]4,464
3	New York Edison, United & Allied	N. Y.	2,877	1,475
8	Philadelphia Electric	Pa.	1,861	877
10	West Penn Power	Pa.	1,728	[4]1,141
11	Public Service Elec. & Gas	N. J.	1,702	821
15	Duquesne Light	Pa.	1,329	703
16	Mohawk-Hudson	N. Y.	1,250	[2]810
22	Brooklyn Edison	N. Y.	958	439
25	Pennsylvania Power & Light	Pa.	909	443
29	Consol. Gas, Elec. Lt. & Pwr..	Md.	787	415
31	Pennsylvania-N. J. System...	N. J. & Pa.	782	[1]938
34	Pa. Water & Power	Pa. & Md.	634	420
37	Penn.-Ohio	Pa. & Ohio	574	203
43	Assoc. Gas & Elec. (Pa. group)	Pa.	413	[4]182
44	Northern N. Y. Utilities	N. Y.	411	[1]398
49	Potomac Electric	Md.	383	238
57	Rochester Gas & Electric	N. Y.	353	185
78	Scranton Electric	Pa.	238	[3]164
81	Penn Central Light & Pwr....	Pa.	227	[4]147
88	Central Hudson Gas & Elec..	N. Y.	212	.....
92	East Penn Electric	Pa.	195	[1]176
102	Atlantic City Electric	N. J.	158	[1]106
107	Edison Electric (Lancaster)...	Pa.	135	[4]100
119	Delaware Electric	Del.	110	[4]111
121	Staten Island Edison	N. Y.	108	[1]101

[1]In 1926. [2]In 1925. [3]In 1924. [4]In 1923.

subsidiaries, and before the year closes it is expected that all the subsidiaries' outstanding preferred stock will be replaced by holding company preferred stock and the bonded indebtedness of the subsidiaries assumed by the holding company. Thus the financial structure will be greatly simplified and the Buffalo, Niagara & Eastern Corporation can be made a true operating company and not merely a holding company.

Looking for New Markets

At no time in the past has there been available so much money at such low rates as now to develop business facilities. Pushed by this incentive and the need of putting excess generating capacity to work earning money, the utilities' major thoughts now are on where to seek and how to develop additional business. All companies are interested in maintaining domestic customers' revenue at such a proportion of the total that it will continue to stabilize gross revenue during industrial depressions. Since municipal services and commercial and office building lighting do not vary appreciably with business conditions, these too are considered attractive stabilizers. Some companies have very diversified load, but wherever any one or a few industries dominate the industrial load attempts are being made to offset these loads by distinctly different loads, either through attraction of new industries or concentration of sales effort on diversified industries. A few utilities are looking to existing and additional interconnections as the chief means of disposing of their product.

One field for development which is beckoning is electric heat. Every place that coal, oil or gas is now used for some process affords a potential market. How extensive each local market is, what classes of applications are most attractive and where specifically to concentrate attention are questions that will have to be answered by each utility surveying its customers' uses of heat as a few companies are doing and others will eventually find it profitable to do. Baltimore and Pittsburgh have just completed detailed surveys.

Applications of electricity to chemical processes have hardly been touched, said one utility man, because neither power salesmen nor works managers of chemical industries have given sufficient study to the existing practical applications of electrochemistry.

Users of process steam and industries utilizing byproducts to produce their own power constitute the major remaining potential market for purchased power outside of that which comes from population growth. This market has been difficult to enter chiefly because industrialists or their consultants do not account for all items charge-

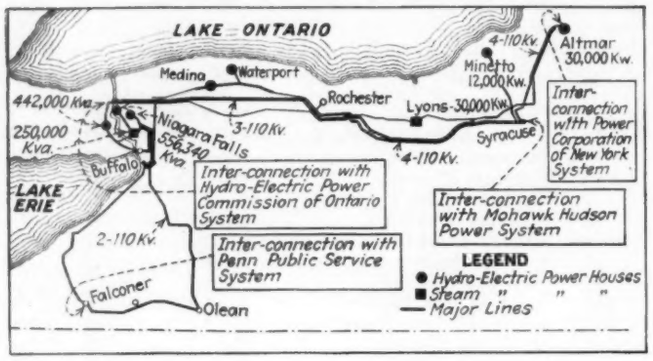
Public of Seven Large Systems

(From Companies)

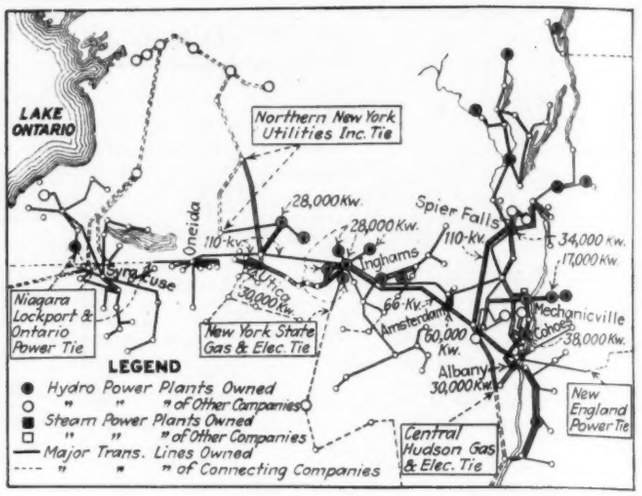
Rochester Gas & Elect.		—N. Y. & Queens—		Consol. Gas (Balto.)		Consol. Gas (New York)[19]	
1927	1921	1927	1921	1927	1921	1927	1921
49.28	49.14	67.9	72.9	51.6	46.9	66.5	71
[7]$905	[7]$387	$1,120	$239	[7]$2,461	$1,549	$10,264	$4,577
[12]2,390	[12]1,384	2,745	992	4,629	2,944	[20]21,904	[20]11,653
[12]$4,219	[12]$2,184	$4,415	$1,489	$7,447	$4,194	.....	.....
143,313	95,548	[14]5,000	[14]7,250	[16]221,600	[16]159,100	[16]988,150	[16]642,220
22,500	12,500	[14]3,000	[14]3,000	[16]36,000	[16]20,000	[16 21]60,000	[16]35,000
82,525	54,746	.....	.....	[16]165,000	[16]138,500	[16]285,000	[16]166,000
110,000	60,000	26,400	13,200	66,000	26,000	132,000	23,000
119	60	[15]453	[15]142	980	521	[1]1,693	[1]1,176
$4.063	$955	[14]$5,312	[14]$1,209	$4,428	[17]$6,243	[22]$50,754	[22]$31,843
2.51	4.57	— Footnote [14]. —		1.48	2.02	1.52	2.16
5.98	7.91	15.4	19.2	9.78	12.9	.....	.....
[2]53,921	.....	252,384	53,214	164,397	73,480	.....	.....
[13]54	[13]41	365	276	506	420	.....	.....
$8.44	$7.29	$3.51	$1.85	[7]$9.64	[7]$8.01	.....	.....
96	.....	.....	.....	93	84	.....	.....
70	.....	.....	.....	87	72	.....	.....
276,679	149,816	249,580	78,141	703,379	359,071	50,754	31,843
38,628	9,896	74,754	24,113	79,934	28,392	.....	.....
238,051	139,920	84,311	54,028	161,529	100,725	.....	.....
		90,515		[18]461,916	[18]229,955	.....	.....
6	.....	29	.....	198	.....	.....	.....

[15]Underground. [16]Kilowatt.
[17]Includes purchase of street railway.
[18]Includes street railway.
[19]Including electric companies, all or a majority of whose stock is owned directly or indirectly.
[20]Employees of combination companies arbitrarily apportioned.
[21]160,000 kw. unit on order.
[22]Gross.

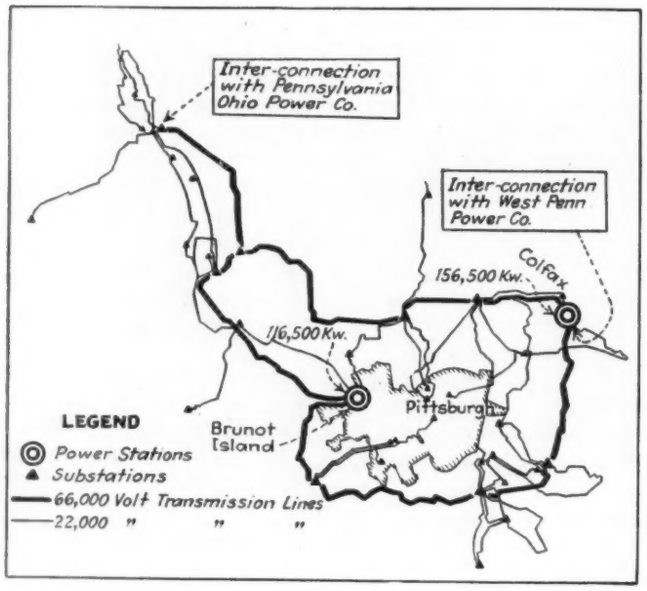
Typical Systems and Interconnections in the Middle Atlantic States



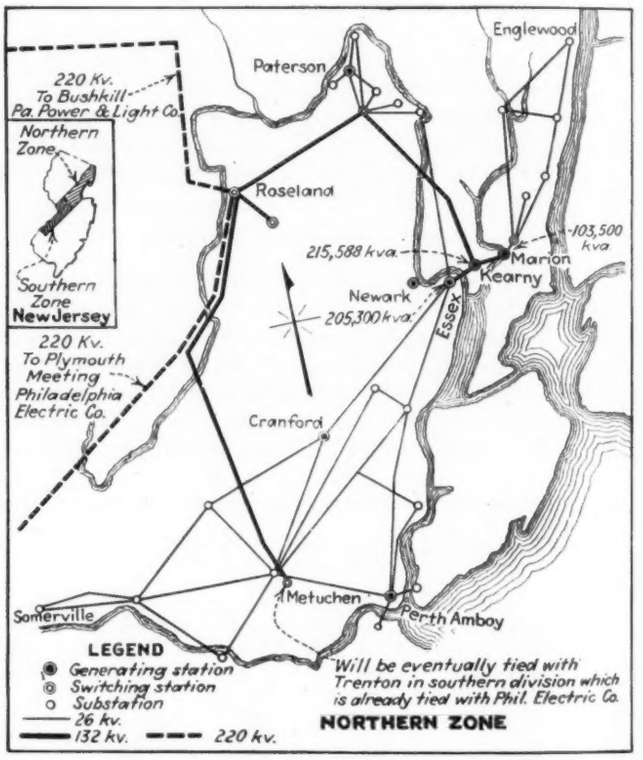
Buffalo, Niagara & Eastern serves Niagara District and eastward



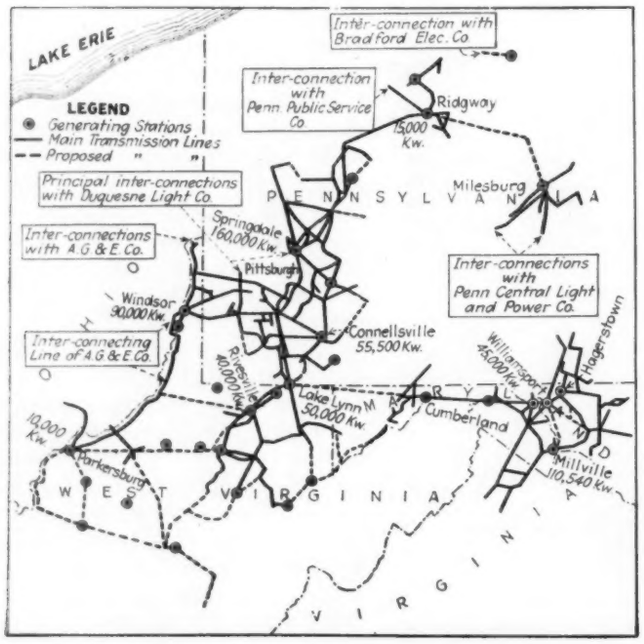
Mohawk-Hudson Power Corporation is unifying service from Syracuse to Albany



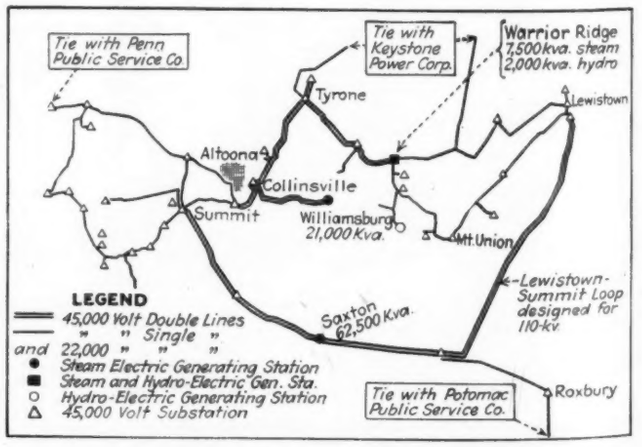
Loop system characterizes Duquesne Light Company



Public Service Electric & Gas Company building 132-kv. loop


LAKE ERIE
Inter-connection with Bradford Elec. Co.
Inter-connection with Penn. Public Service Co.
Ridgway
15,000 Kw.
LEGEND
Generating Stations
Main Transmission Lines
Proposed " "
Principal inter-connections with Duquesne Light Co.
Milesburg
P E N N S Y L V A N I A
Springdale 160,000 Kw.
Inter-connections with A.G. & E. Co.
Pittsburgh
Inter-connections with Penn Central Light and Power Co.
Windsor 30,000 Kw.
Inter-connecting Line of A.G. & E. Co.
Connellsville 55,500 Kw.
Williamsport 45,000 Kw.
Hagerstown
Riverside 40,000 Kw.
Lake Lynn 50,000 Kw.
M A R Y L A N D
Cumberland
10,000 Kw.
Millville 110,540 Kw.
Parkersburg
W E S T V I R G I N I A
V I R G I N I A

West Penn Power Company tying together scattered plants



Penn Central Light & Power loop serves scattered industries

able to power production as rigorously as utilities do. If industrialists can be induced in some way to give more attention to proper accounting for production costs one of the greatest obstacles to proving the economics of purchased power to industrial executives will be broken down.

Meanwhile there are two approaches to this market that are being tried with varying degrees of success. To win process-steam users over to purchased power, the Rochester utility just recently built a steam-heating plant in the load center of about twelve large isolated-plant-operated industries and is already serving one of them with steam and electricity. In reducing the steam pressure for steam supply it passes the steam through turbo-generators floated on the utility system. As time passes it hopes to convince the other surrounding process-steam users that they can afford to do likewise. In eastern Pennsylvania it has been found feasible for one industry to locate near the utility's generating station from which it secures both steam for process operations and electric power for other operations, but many utilities point out that such a location is seldom convenient for industrial plants.

Interchanging power with large industrial private plants on the same basis as with another utility is being tried with varying degrees of success with the understanding that the industrials will purchase all increases in power demand and the hope that a taste of purchased power will induce them eventually to replace obsolete isolated plant equipment by purchased power. Industrial interchange of power, where it has been practical, has not brought the benefits of interconnection with other utilities because the surplus power from industrials is usually available to utilities when it is not needed, but

Do We Want Applause Cards?

By Frank L. Dame
President the North American Company

FOR a time applause cards were in vogue in the radio field. Tons of mail came in response to the familiar request: "If you have enjoyed this program write to So-and-so Company direct, or to the station to which you are listening." Today these cards have largely disappeared from radio. The movies, in a limited way, are carrying the idea a step further by asking for opinions of some films.

In most lines of business the applause card, in one form or another, has been sought. Is this really what is wanted? Is not constructive criticism a better guide for future plans for improvement?

My conclusion several years ago was that our company did not want applause cards, but on the contrary wanted criticism that was constructive. As a result we inaugurated a policy of sending letters to every person whose name disappeared from our stockholders' list asking frank expressions as to the reason for the disposal of the shares. The replies averagé more than 55 per cent of our inquiries, and all of them are tabulated and studied. I am glad to say that with few exceptions we have found no serious complaints regarding our policies and that cases of complaint have been generally removed by explanations of stockholders' previous misunderstandings.

This is a fair illustration of the value of constructive criticism as against mere applause. Criticism makes more noise than applause; it has greater news value because it is not so commonplace. This is quite apparent, and is very well illustrated, in the proceedings of the Federal Trade Commission in its examination of the public utility industry.

A year ago I publicly expressed my views on some of the conditions in the industry that merited criticism, and later events showed that these conditions were its disturbing elements. It was inevitable that such conditions should lead to criticism, which, unfortunately, has been more destructive than constructive. Consequently the emphasis has been heavy upon the mistakes, minor and major, which have been revealed. And the noise of this

Frank L. Dame

criticism—that which is justified and that which is not—renders quite inaudible the public approval of the policies and practices of the larger part of the industry.

Criticism, to be valuable, must be constructive. I welcome that kind, and would rather have it than tons of applause cards. I join in the criticism of improper conditions and practices in the industry on the ground that their correction will benefit the public, the industry and its millions of investors.

A case in point has been brought forward by the secretary of the National Educational Association. He indorsed the industry's action in preparing information of value for the schools as a work of education, but he condemned the improper inclusion of propaganda against public ownership. And he asked the association to consider at its Minneapolis meeting, June 30, a report on the extent to which agencies other than public utilities "have imposed on teachers in the schools." To me this is constructive criticism, and it embraces all efforts toward propaganda, against the public utility industry and in favor of it.

We do not want applause cards, but constructive criticism.

the arrangement has proved advantageous in several places as a means of opening new markets.

What is known as a "business incubator" has been started in Rochester for the purpose of stimulating new industries or new processes. Electricity in all forms, steam at various pressures and superheats, gas and a variety of chemicals are made available in a loft building where a large number of industries can experiment with new processes at less expense than if they provided all their own facilities. In Baltimore industries which are too small to build their own quarters and equip for electric, steam and gas services have had the opportunity for twelve years of renting industrial quarters provided with these services. Where found worthy they have been able to secure financial aid until they are able to proceed on their own resources.

Quite a tendency is now prevalent for utilities to co-operate with their local chambers of commerce in attracting new industries into their territories. On the other hand, one state chamber of commerce is discouraging such activity, as it declares that national records prove that there are seldom economic justifications for such changes. Commenting on this subject, one utility says it never seeks outside industries unless they show a determined intention to move or decentralize their plants and then active efforts are made to interest them in local conditions. Decentralization of industries to reduce distribution costs is accounting for many of the changes in industrial plant locations, although cost of power has influenced congregation of electrochemical and metallurgical industries at Niagara Falls.

In western Pennsylvania it is declared that the most favorable conditions for progress cannot exist until the bituminous and anthracite mine operators adjust their difficulties. Subnormal production in some steel mills, copper rolling and drawing plants and metal-working factories is affecting some utilities which depend to a large extent on these industries for their power load.

For increased commercial load as distinguished from industrial, utilities are looking to selling purchased power to new buildings before they sink their money into private plants, to co-operating with architects and building owners in laying out the most effective lighting and to improving store and show-window lighting. Some utilities feel that through installation of the best street lighting, inadequate show window and store lighting can be most effectively demonstrated. Commercial refrigeration has been found a very attractive load builder in some communities. The potential market for this air conditioning has developed wherever department stores, theaters and other public gathering places have been shown the beneficial effect of artificially cooling interiors.

Inducement Rates and Merchandising

Because domestic customers utilize such a notoriously low percentage of the investment required to serve them and require such high unit operating expenses for testing and reading of meters, accounting, billing, etc., and also because their aggregate revenue fluctuates so little with economic conditions, utilities as a whole are showing unusual interest in developing their usage of energy. Not many years ago few companies had inducement rates to stimulate more extensive usage, but a large number of utilities in the Middle Atlantic States now have them or are introducing them. With such rates customers can be impressed with the fact that any additional usage they make of electricity can be had at very small expense. Where the companies have backed up these rates with sales effort and do not require their domestic customers to take too many kilowatt-hours at the top step before they can take advantage of the low step, some really remarkable increases in customer consumption have been made. But the surprising situation in some local-

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Customer Ownership on Increase

By P. G. Gossler
Chairman of the Board
Columbia Gas & Electric Company

P. G. Gossler

IT IS gratifying to note that the sale of stocks and other securities by electric light and power companies to their customers during the past year have exceeded the record of any previous year. This is particularly gratifying because of the fact that market conditions during the past year have been unusually favorable, through low interest rates, for selling of long-term bonds for raising new capital, and also for the refunding of outstanding issues of bonds or stocks to meet maturities, or where outstanding securities may be called. As the sale of securities to customers is, for the greater part, in preferred stocks representing junior securities, it would be expected that the proportion of such junior financing would not be as large in years where a very strong bond market prevails. It is most significant, therefore, that customer-ownership shares sold during 1927, as reported, aggregated 3,484,000 shares, which is an increase of almost 30 per cent over the record in 1926. Also, the number of electric companies that have issued such stocks has increased during the year to 242, compared with 228 so reporting last year. The number of new stockholders added last year was 235,674, which brings the total to date to 1,668,000 stockholders having purchased an aggregate of 16,622,000 shares.

ities is that the increased consumption has not increased the average revenue per customer. On one system where the average domestic consumption is over 700 kw.-hr. a year the revenue is only $25. Furthermore, when inducement rates are first introduced it has taken as much as one and one-half years to bring the domestic revenue up to what it was on the old flat rate. So utilities, while recognizing the wholesome effect of such rates on public relations, are chiefly concerned with finding applications which will be attractive to customers and at the same time build up the revenue per customer.

Some difficulty has been experienced in introducing inducement rates without taking too big a loss in revenues or raising the small customers' bills. If the inducement rate is formed to keep the small customers' bills the same the revenue loss from the domestic customers as a whole is considerable. And if the rate structures are made so that this loss is minimized, the antagonism of small consumers whose bills are raised is aroused. As a result some utilities have expressed the opinion that the time to institute an inducement rate is when surplus earnings are expected.

Along with this tendency to give domestic customers inducement rates has therefore come an increased incentive to concentrate on merchandising. There are still many schools of thought, ranging from merchandising purely for merchandise profit without regard to load building to merchandising chiefly for load building.

There has been a widespread improvement of electric shop layouts for the convenience of customers even in small towns. Greater attention is being given to simplifying applications for service, securing duplicate bills, adjusting complaints and paying bills.

More companies are adopting practices that improve public relations and not merely talking about them. Among some practices which have been adopted are: Removing sharp differences in practices brought about by mergers of adjacent companies; discontinuance of signed applications and deposits except where credit is questionable; leaving service connected in empty homes; following up service connection orders; minimizing public inconvenience from construction work; simplifying payment of bills; expediting correct connection of incoming telephone calls; remedying causes of radio interference; training of employees in courtesy by the legal-case method; committees formed of department heads to adjust practices that cause public irritation, and supervision of telephone complaint adjustments.

Some Actual Budgets for 1928

The total of the expenditures here listed, excluding duplications and Ontario Hydro, is $301,555,770. Of that amount $295,655,000 can be associated with installations having a combined rating on Jan. 1, 1928, of 8,516,115 kw., according to the best available records. The total for the United States at that time may be taken at 25,760,000 kw., again using the most recent figures available.

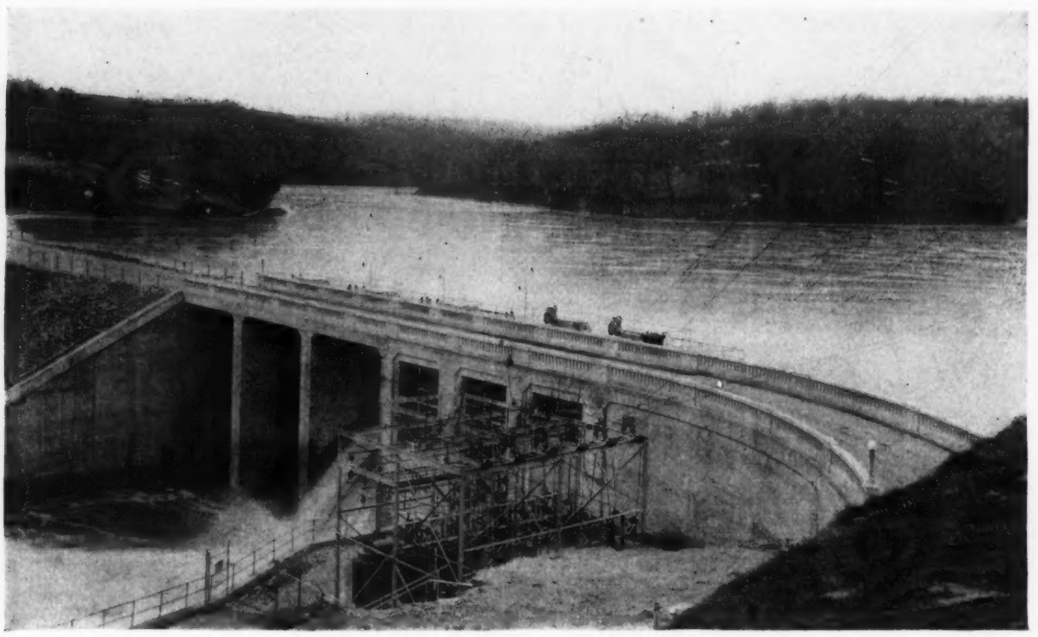
Company	Total, 1928	Steam	Hydro	Transmission	Distribution	Substation	Miscellaneous
1. Alabama Power	*H* $15,000,000	.....	.....	.....	.....	.....	.....
2. Beverly Gas & Electric (Mass.)	*F* 81,000	.....	.....	.....	$78,000	$2,000	$1,000
3. Carolina Power & Light (Asheville Division)	400,000	.....	.....	$200,000	.....	.....	.....
4. Central Illinois Light (Peoria)	*A*	.....	.....	.....	.....	.....	.....
5. Cleveland Electric Illuminating (Ohio)	9,800,000	.....	.....	.....	.....	.....	.....
6. Columbus, Ohio—Municipal	515,000	.....	.....	.....	.....	.....	.....
7. Commonwealth Edison (Illinois)	27,346,000	.....	.....	.....	.....	.....	.....
8. Commonwealth Power Corp.	17,500,000	.....	.....	.....	.....	.....	.....
9. Consumers Power (Jackson, Mich.)	*A*	.....	.....	.....	.....	.....	.....
10. Dayton Power & Light (Ohio)	600,000	.....	.....	200,000	.....	.....	.....
11. Detroit Edison (Mich.)	30,164,000	8,862,700	.....	5,042,000	*B*	5,283,100	10,976,200
12. Eastern Massachusetts Electric	*F* 257,500	.....	.....	250,000	.....	5,000	2,500
13. Empire District Electric (Mo.)	1,100,000	.....	.....	.....	.....	.....	.....
14. Georgia Power	*H* 12,755,000	.....	.....	.....	.....	.....	.....
15. Gulf States Utilities (Texas)	*I* 200,000	.....	.....	.....	.....	.....	.....
16. Houston Lighting & Power (Texas)	6,242,804	3,254,845	.....	450,089	907,779	891,841	738,250
17. Illinois Electric Power (East Peoria)	*A*	.....	.....	.....	.....	.....	.....
18. Illinois Power (Springfield)	*A*	.....	.....	.....	.....	.....	.....
19. Kansas Gas & Electric	3,000,000	.....	.....	.....	.....	.....	.....
20. Malden Electric (Mass.)	*F* 1,000,000	.....	.....	135,000	475,000	350,000	30,000
21. Malden & Melrose Gas Light (Mass.)	*F* 500,000	.....	.....	.....	.....	.....	.....
22. Michigan Electric Power (Thumb District)	500,000	.....	.....	.....	.....	.....	.....
23. Michigan Electric Utilities (entire State of Michigan)	39,000,000	.....	.....	.....	.....	.....	.....
24. Nebraska Power (Omaha)	1,000,000	.....	.....	.....	.....	.....	.....
25. New England Power	2,202,466	.....	.....	1,107,910	.....	1,094,556	.....
26. North Boston Lighting Properties	1,935,500	*C*193,000	.....	406,000	855,000	358,000	123,500
27. Northern States Power	8,000,000	.....	1,500,000	.....	.....	.....	.....
28. Ohio Edison (Springfield)	*A*	.....	.....	.....	.....	.....	.....
29. Otter Tail Power	350,000	232,000	*D*	.....	118,000	.....	.....
30. Pacific Gas & Electric (San Francisco)	22,500,000	.....	.....	.....	.....	.....	.....
31. Philadelphia Electric (Penna.)	*G* 12,000,000	.....	.....	.....	.....	.....	.....
32. Philadelphia Suburban-Counties Gas & Electric (Penna.)	*G* 6,000,000	.....	.....	.....	.....	5,000,000 to	.....
33. Public Service Electric & Gas (N. J.)	22,000,000	.....	.....	7,000,000	700,000	6,000,000	.....
34. Puget Sound Power & Light (Wash.)	5,000,000	1,267,000	.....	787,000	1,652,000	618,400	.....
35. Salem Electric Lighting (Mass.)	*F* 443,000	180,000	.....	21,000	167,000	.....	75,000
36. Salem Gas Light (Mass.) (gas only)	*F* 82,000	.....	.....	.....	.....	.....	.....
37. San Antonio Public Service (Texas)	750,000	.....	.....	750,000	.....	*E*	.....
38. San Diego Consolidated Gas & Electric (Calif.)	4,000,000	.....	.....	.....	.....	.....	.....
39. Sand Springs Power & Light (Okla.), now part of Oklahoma Wt. & Pw. Co.	2,500,000	.....	.....	.....	.....	.....	.....
40. South Texas Public Service	150,000	.....	.....	150,000	.....	.....	.....
41. Southeastern Power & Light	40,000,000	.....	.....	.....	.....	.....	.....
42. Southern California Edison	32,000,000	5,987,000	5,982,000	3,100,000	2,565,000	*J*	.....
43. Southern Indiana Gas & Electric	*A*	.....	.....	.....	.....	.....	.....
44. Stone & Webster, Inc. (Southern Texas properties)	3,000,000	.....	.....	.....	.....	.....	.....
45. Suburban Gas & Electric (Mass.)	*F* 154,000	3,000	.....	.....	135,000	1,000	15,000
46. Tennessee Electric Power	*A* 5,000,000	.....	.....	.....	.....	.....	.....
47. United Gas Improvement and Allied Companies	20,000,000	.....	.....	.....	.....	.....	.....
48. Hydro Electric Power Commission of Ontario	*K* 2,470,000	.....	.....	.....	.....	.....	.....

A—Included in Commonwealth Power Corporation.
B—Included in miscellaneous.
C—Includes $10,000 for general structures.
D—Included in steam.
E—Included in transmission.
F—Included in North Boston Lighting Properties.
G—Included in United Gas Improvement.
H—Included in Southwestern Power & Light.
I—Included in Stone & Webster, Inc.
J—Included in distribution.
K—Not included in U. S. total.

Service in Rural Areas

Prairie states are interconnecting many independent properties and gradually consolidating. Load concentrations are chiefly around cities. Hydro powers have been developed to a high degree. Rural service active

By FRANK R. INNES
Western Editor



Delhi station Interstate Power Company

THE West North Central region, comprising Wisconsin, Minnesota, the Dakotas, Nebraska and Iowa, is predominant agricultural, including, as it does, the states which lead in the production of wheat, corn, barley and oats. Mineral resources exist in three of the states, but principally in Minnesota. A large share of the country's iron-ore production comes from the Mesaba Range in northern Minnesota. South Dakota contributes about 10 per cent of the national production of gold and, with its sister state to the north, has unexploited mineral resources, including petroleum.

Except in the southeastern part of Wisconsin, where a great and diversified manufacturing activity exists, the principal industries of the group are grain milling and meat packing. Milling centers largely in and around Minneapolis, while packing is chiefly concentrated at Omaha. However, these two industries are widely scattered over these states. In Wisconsin, and to a lesser degree in Minnesota, lumbering is an important activity, there being in these two states one of the few remaining stands of Northern pine. On account of the introduction of modern methods of timber production, these timber stands will remain in the productive state for many years to come.

Dairying and the manufacture of dairy products are important in the eastern part of this area, but particularly so in Wisconsin, which is rapidly earning a wide reputation for cheese production.

Population in this territory has increased nearly 6 per cent since 1920, the greatest increase having occurred in Minnesota and Wisconsin, the former adding nearly one-third and the other more than a quarter of a million.

Therefore there is not much to indicate any slacking up of electrical development in this region. And this evidence is not controverted by the facts concerning that development.

Some of the major electric utility interests concerned in these states are: The Electric Bond & Share Company, Standard Gas & Electric Company, Middle West Utilities Company, Utilities Power & Light Corporation, United Light & Power Company, American Gas & Electric Company, North American Light & Power Company, North American Company, American Light & Traction Company, United Gas Improvement Company and Engineers Public Service Company.

The Lakeside station of the Milwaukee Electric Railway & Light Company was the first large generating station to burn pulverized fuel. It was a pioneer in the use of high-pressure steam and the first large-scale studies of coal distillation in America were carried on there.

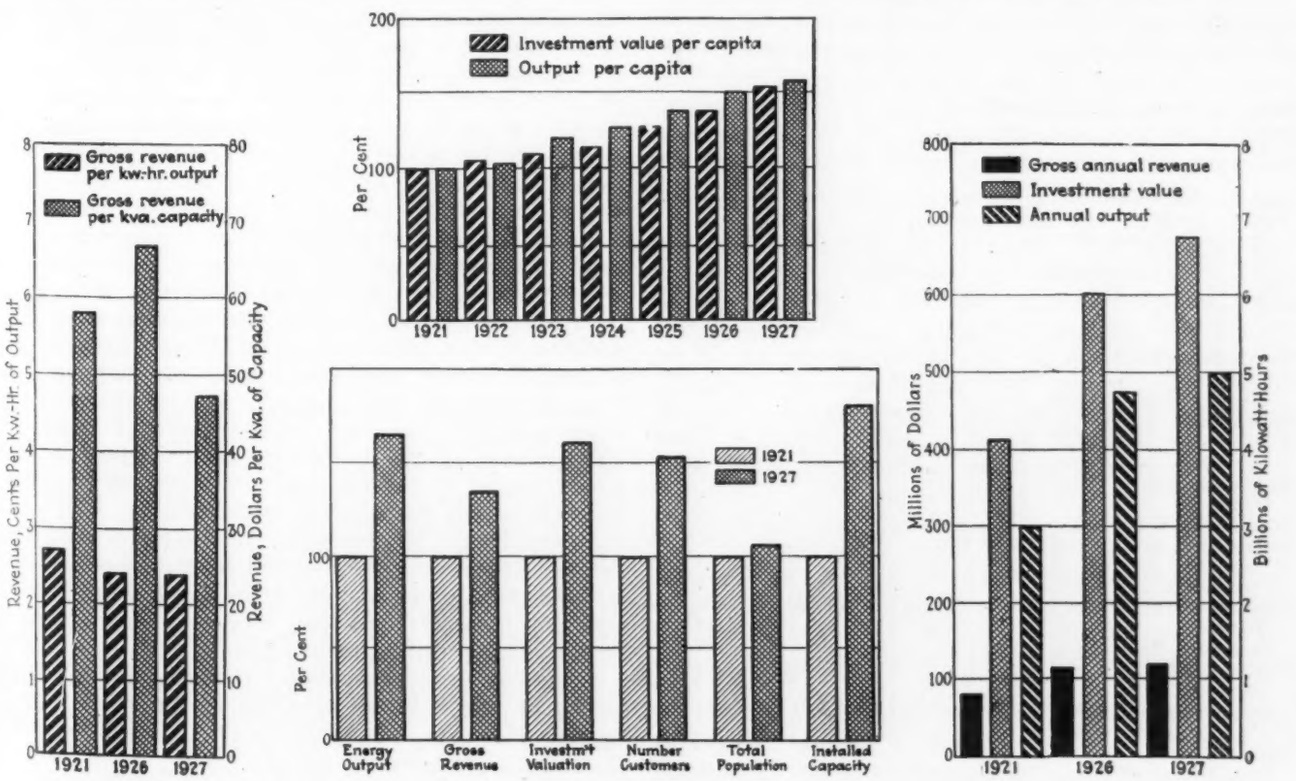
Privately operated utilities have made great progress

Gross Revenues, Population, Generator Rating, Output and Plant Values for Six States

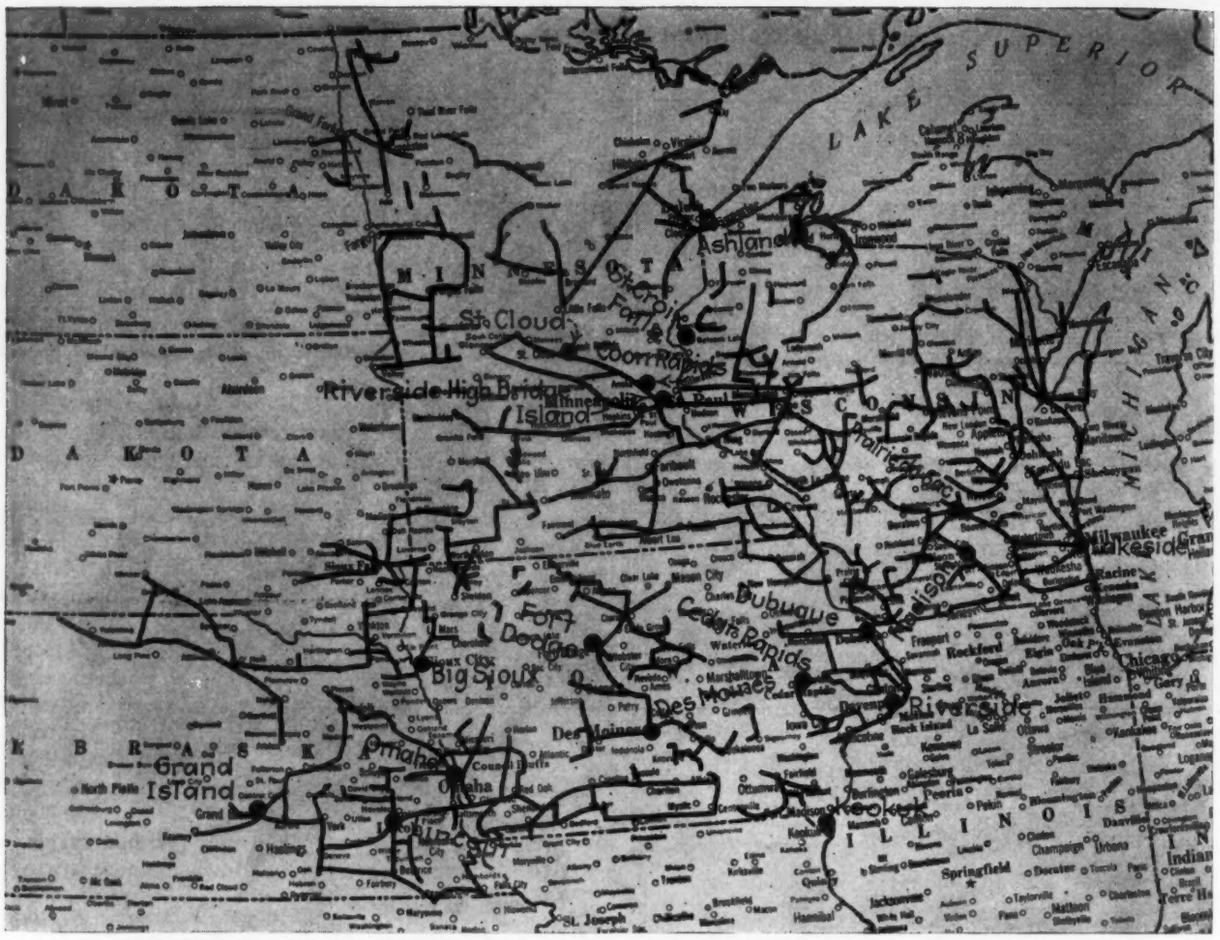
	Gross Revenues		Population		Generator Ratings, Kva.		Generated Kilowatt-Hours in Thousands		Values of Plant and Equipment	
	1921	1927	1921	1927	1921	1927	1921	1927	1921	1927
N. Dakota..	$857,000	$1,205,000	646,000	640,000	30,172	21,200	31,484	50,000	$16,192,000	$22,117,000
S. Dakota..	1,394,000	2,023,000	649,000	696,000	36,912	35,800	51,264	84,000	20,608,000	25,724,000
Nebraska...	7,210,000	9,980,000	1,315,000	1,396,000	134,527	176,000	264,729	414,000	56,120,000	76,855,000
Iowa.....	26,900,000	34,000,000	2,409,000	2,425,000	357,893	602,000	989,209	1,411,000	90,648,000	151,404,000
Minnesota..	19,940,000	26,030,000	2,443,000	2,686,000	358,957	466,000	733,124	1,090,000	115,368,000	177,184,000
Wisconsin..	24,930,000	46,200,000	2,688,000	2,918,000	483,335	724,000	916,819	1,919,000	116,288,000	220,143,000
Totals...	$81,231,000	$119,488,000	10,150,000	10,761,000	1,401,796	2,538,000	2,986,629	4,968,000	$415,224,000	$673,427,000

against the local independent plant idea, whether it is expressed in municipal or private ownership. To the evidence presented by the published analysis of electricity rates before and after absorption of 62 Iowa municipal undertakings by Arthur H. Ford of Iowa City there may be added the following information furnished by F. R. Moulton of the Utilities Power & Light Corporation: "An examination of costs to the consumers served by local utilities in towns of the same population classes and in the same territory as those on the system of the Interstate Power Company shows that the privately owned central station saved $1,443,351.70 for its customers in 1927, this sum being the difference between what they actually paid and what they would have paid if they had been served from an independent plant and not from an interconnected system. In the last seven municipal plants taken over by the company the saving in electricity costs to consumers was 15.6 per cent for lighting service and 16.1 per cent for power. These figures take no account of the payment of taxes by the privately owned utility, whereas the municipal plants paid no taxes. Correcting them for this factor makes the actual savings 18.6 per cent for light and 19.4 per cent for power. That these savings will increase as time goes on is indicated by the fact that in 1927 voluntary rate reductions by the Interstate Power Company made a total reduction in customers' bills of $119,691.54."

In spite of the numerous municipal utilities in these states, or perhaps because of them, consolidation of electric properties into connected operating groups has made much progress. This progress would probably have been more rapid at first had it not been for the resistance interposed by independent utilities having a long history of prosperity and public regard, which made them reluctant to relinquish independence for the unproved advantages of consolidation. But this phase is now in the past. However, on account of the militant independence of the average municipal undertaking and the let-well-enough-alone attitude of some of the privately owned properties, base-load plants and unit planned systems are not so characteristic of these states as they are of the West and South. Instead, the systems are built up around the already established generating stations of the cities. In many cases these stations have taken on more than the local responsibility with which they started and assumed the character of base-load stations.



North Central energy output has grown much faster than population in six years



Interconnections, hydro and steam plants have thrived in North Central States

Concentration of power around important cities is not so conspicuous in Minnesota and Wisconsin, where the development of water powers has spread the systems out more. The plants of the Middle West Utilities subsidiaries on the Wisconsin River, of the Northern States Power Company on the Mississippi and St. Croix Rivers and other developments in northern Wisconsin and northeastern Minnesota have either been recently built or expanded from earlier installations at the same sites. In these two states a great many water powers were wholly or partially applied to milling long before the present era of electric power. As electric power came into use numbers of these were adapted to generation for local supply. In not a few cases it has been found advisable, from considerations of economy or policy, or both, to retain these water powers for continuous use or for stand-by when interconnected systems grew up. As a result the hydro powers of these states have been developed to a higher degree than elsewhere.

Number of Customers in Six North Central States

	1921	1927
North Dakota (total)	44,000	59,400
Domestic		46,400
Commercial and power		13,000
South Dakota (total)	56,000	69,150
Domestic		53,900
Commercial and power		15,250
Nebraska (total)	152,500	206,600
Domestic		169,000
Commercial and power		37,600
Iowa (total)	273,500	407,000
Domestic		328,200
Commercial and power		78,800
Minnesota (total)	313,500	476,300
Domestic		384,750
Commercial and power		91,550
Wisconsin (total)	316,000	564,900
Domestic		443,900
Commercial and power		121,000
Totals	1,155,500	1,783,350
Domestic		1,426,150
Commercial and power		357,200

Practically the only fuel used for steam generation of electricity in this region is coal, the greater part of which is brought in from Illinois and Kentucky fields. However, in Iowa and the Dakotas, also in Minnesota in lesser quantity, there are large deposits of low-grade bituminous coals and lignite. Iowa is much interested in the utilization of its local coals and a number of generating stations in the state are experimenting with burning these fuels. Not much has been done in exploiting lignite because the deposits are far from centers of power use and the national coal resources will have to be considerably more depleted than now to justify adding a freight charge to the cost of lignite.

Long-distance, high-voltage transmission of large blocks of power is not common in the north central region. However, it is used by a few utilities that operate major hydro-electric stations. The greater part of the systems in these states might be referred to as high-voltage distribution.. The reason for this is that most

of the systems have spread out from established nuclei by progressive extension of lines. Load concentrations at the end of long lines are infrequent; the more common condition is that of load distribution throughout the whole length of lines.

Interconnection, as a means for staggering investments in generating capacity between contiguous systems, is quite a common practice. The interconnections serve chiefly as means of exchanging reserve capacity rather than for the continuous transmission of large quantities of energy. A typical example of this class of interconnection is the 132-kv. tie between the Milwaukee Electric Railway & Light Company and the Public Service Company of Northern Illinois. This tie makes available to the systems of southeastern Wisconsin a certain part of the reserve capacity of the Chicago power pool and vice versa, both areas profiting in terms of system reserve investment even if no power were ever transmitted either way on the line.

In the western and more thinly populated part of this region the building of transmission lines is almost a direct measure of the taking over of municipal utilities and of

Consolidations Increase in Prairie States

By Don M. Sterns
Vice-President Iowa Public Service Company

Don M. Sterns

ELECTRIC companies in the Middle West Division of the National Electric Light Association, comprising the states of Iowa, Nebraska, Kansas and Missouri, serve 1,617,200 customers in a population of 9,055,065. Figuring four and a half people to a family, more than seven out of nine people have electric service.

A steady and gratifying increase in production and consumption of electric energy, more and better construction of transmission lines and continuing consolidation of systems are the outstanding features of the development of the electrical industry during the past year in the Middle West Division.

The erection of new big and economical steam-generating stations and the development of new water-power projects where they are practical have added to the power available. The building of new transmission lines into hitherto undeveloped territory has carried this power to nearly every quarter of this division, and the aggressive salesmanship of member organizations has opened up new fields for consumption.

Production has increased by 622,945,000 kw.-hr. during five years, being 3,019,752,000 in 1923 and 3,642,697,000 in 1927.

During the four years ended Jan. 1, 1928, nearly a quarter of a million new customers were added to the central stations. In 1924 there were 1,386,627 and in 1927 there were 1,617,200 customers. During the year 1927 there were added 77,500 new customers. The number of customers by classes and the increase were as follows:

	1926	1927	Increase
Domestic lighting	1,249,800	1,313,300	63,500
Commercial lighting	215,000	224,500	9,500
Power and miscellaneous	74,900	79,400	4,500
Total	1,539,700	1,617,200	77,500

Thousands of miles of new transmission lines have been built and the voltages of many more raised. In Iowa alone 1,000 miles of new lines were constructed in each of the past two years. It is gratifying to have the electrical engineer of one of our commissions make the public statement that the character of the construction of the transmission lines in his state far exceeds the requirements of the commission. As a result of the extension of these lines service has been extended to all of the cities and most of the towns. In my state, Iowa, 99.7 per cent of the urban population is located in cities and towns that have electric service.

The problem of the electrification of the farms of this great agricultural district is receiving the most assiduous attention of the engineers and operators. Many thousands of dollars have been spent in research work during this time to determine how energy can be used on the farm to the profit of the farmer and the industry.

Consolidations continue, giving the small communities the benefit of vast power pools, better service and lower rates. Speaking of Iowa particularly, and the same trend is equally noticeable elsewhere in the division, the number of separate and independent operating companies in 1922 was 149. On January 1, this year, the number was 27. During the same period 79 municipally owned establishments have been absorbed by the larger Iowa operating companies. Each of these towns is enjoying a lower rate, has better and more dependable service and all the reserve power necessary for the development of new industries.

Prospects for development during the present year are gratifying and there is every reason to believe that the increase in the use of energy will continue even more rapidly than during the past.

Economic and Social Aspects of Rural Service

"I HAVE already said elsewhere to the power companies that having, in their own interest, extended their great power transmission lines through rural communities in order to connect one city with another, they have taken on an obligation to serve the rural population of the area in which they operate. This does not mean that they can run service to the last farm or perhaps even to the last village in that district, but it does mean that the power companies must view their obligation as having both an economic and social aspect.

"The power company cannot refuse country lines because they are unprofitable. They cannot ride the economic hobby to the point where electrical service is not generally available in the community. Nor, on the other hand, can they ride the social hobby, as some visionary persons urge, to the point of financial bankruptcy. Wise human judgment must be exercised in the service of the constituency of the power company.

"Rates, so far as possible, should be simplified. The slide rule is not as unerring as the engineer sometimes thinks. The power company cannot use it as the sole guide to the social needs of a community in which human understanding and human sympathies must be mingled with economics in order to get a practical result. The power companies should recognize this kind of obligation to the farmer, should study his needs, and within every reasonable economic limitation supply his service.

"The only economic limitation is that the power companies should be permitted to secure earnings from the community as a whole which will yield a fair return on the investment of the power company as a whole. Therefore, rates should, in my judgment, be made practical for the farmer, and the Public Service Commission should co-operate and even insist upon their establishment. Some part of the savings resulting from these great transmission systems should be applied to the extension of farmers' service rather than be granted wholly to the cities in the diminution of their rate. This is advantageous to the farmer and is sound for the city."

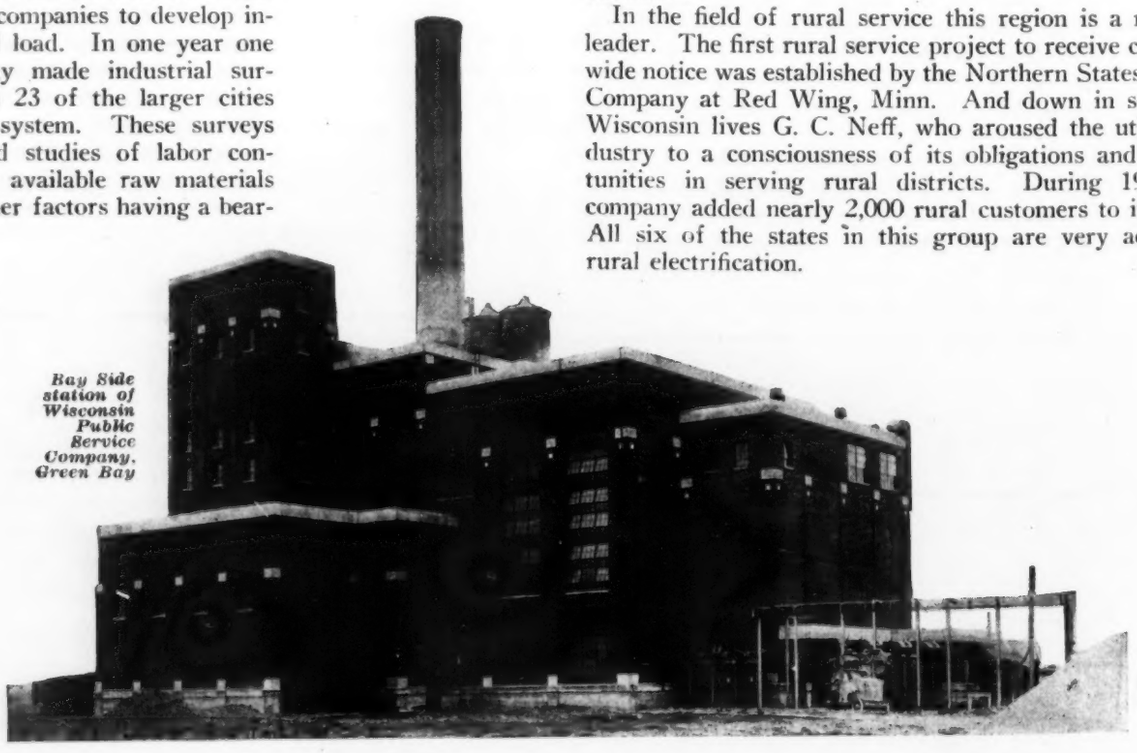
—OWEN D. YOUNG,
Chairman of Board General Electric Company.

the absorption of independent properties into the larger systems. The total length of transmission lines of 13,200 volts and over in these six states must approach close to 20,000 miles, of which probably not more than 15 per cent was in existence ten years ago.

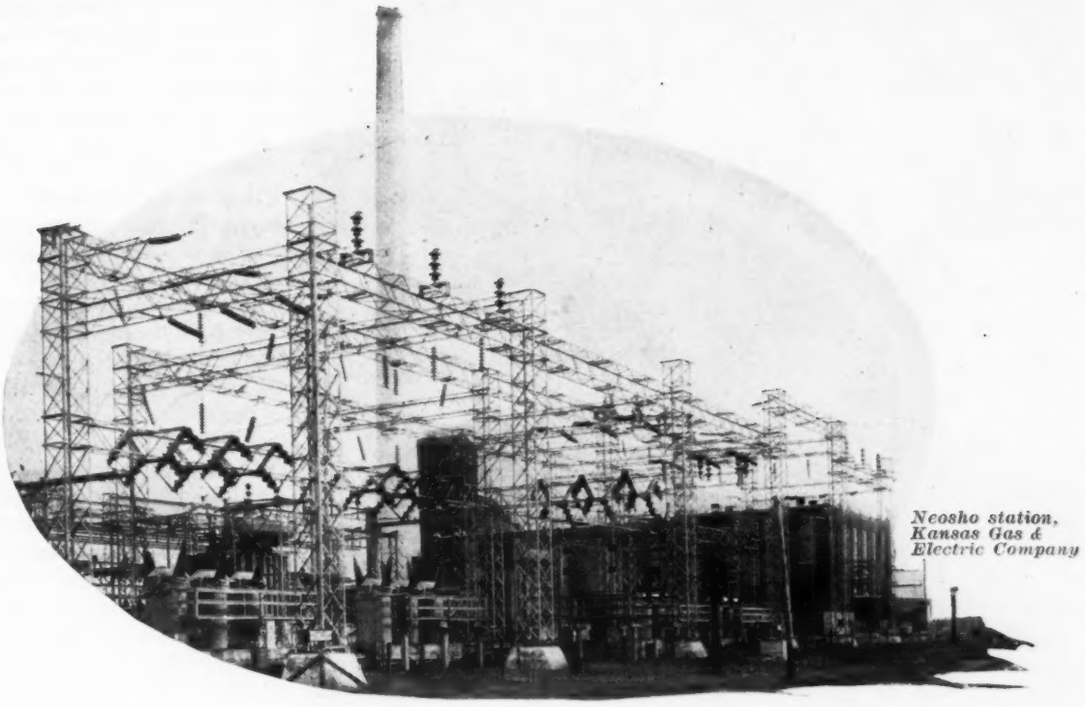
Since Nebraska includes one of the leading utility exponents of vigorous sales activity, it is almost inevitable that the utilities of this region should be thoroughly imbued with the commercial spirit. That this spirit is at work in more than the merchandising of appliances is evident from the efforts of some of the companies to develop industrial load. In one year one company made industrial surveys in 23 of the larger cities on its system. These surveys included studies of labor conditions, available raw materials and other factors having a bearing on the locations of definite types of industries. This activity is not confined to the one company.

Virtually every utility in the north central area is merchandising electric appliances as a part of its normal function. In spite of the availability of gas service in all of the cities and many of the larger towns, electric ranges are being sold in increasing numbers. Refrigerators are selling in large volume against the competition of natural and artificial ice. Water heaters apparently are coming into appreciation from both utilities and customers.

In the field of rural service this region is a national leader. The first rural service project to receive country-wide notice was established by the Northern States Power Company at Red Wing, Minn. And down in southern Wisconsin lives G. C. Neff, who aroused the utility industry to a consciousness of its obligations and opportunities in serving rural districts. During 1927 his company added nearly 2,000 rural customers to its lines. All six of the states in this group are very active in rural electrification.



Bay Side station of Wisconsin Public Service Company, Green Bay



Neosho station, Kansas Gas & Electric Company

Southwest

Accumulates Momentum

Base-load stations are large factors in power supply. Transmission networks already widely established and are still growing rapidly. Commercial activity yields tangible results

By FRANK R. INNES
Western Editor

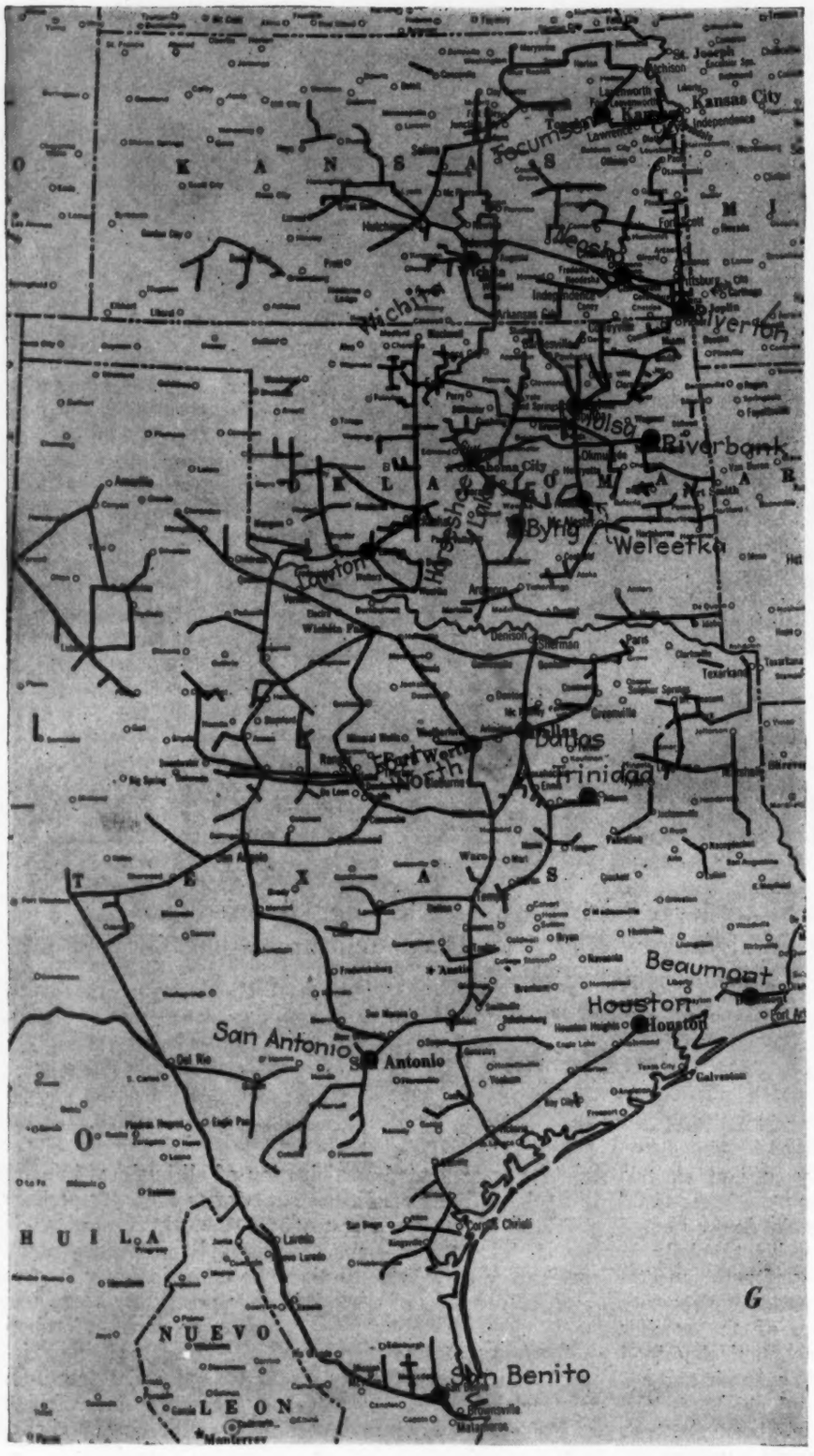
COMPARED with its status ten years ago, electric development in the Southwest has made more rapid progress than probably anywhere else in the United States. This development has been evident chiefly in extension of transmission lines, building of new generating stations or extension of old ones, spreading of service to new communities and consolidation of the smaller properties into larger ones for more economical unified service. The greatest improvements in economic and social conditions have apparently occurred chiefly in the sections where electrical development has been greatest. Regardless of whether general or electric development has forerun the other, either will stimulate the progress of the other.

Great as has been the progress of the last decade, the future is most enticing because this section has only started in its development. Many undeveloped mineral resources are waiting to be worked. The rapidity with which general development will occur will depend on the extent to which these territorial resources are made known to industrial capital, on attraction of industries to serve this great expanse which is now dependent on distant sources, continued extension of electric service and on co-ordinated participation of all business interests in making living conditions superior to adjacent sections.

The Southwestern states of Missouri, Kansas, Oklahoma, Texas, Louisiana, Mississippi and Arkansas are predominantly agricultural. The climatic range is great and the products of the soil include practically every fruit and vegetable known to the temperate zone. Cotton is common to most of these states and is easily the most important product of this territory. Industrial activity is more closely associated with the extraction of raw materials from the earth and with their preliminary processing than with the manufacture of finished commodities. Industry is growing more and more rapidly as new people come in. The population has increased $7\frac{1}{2}$ per cent in six years—a gain of more than one and one-third millions.

As in other regions, electrical development here is not largely and directly affected by agriculture. However, the basic economic conditions determined by agriculture must be taken into account.

The production of wheat and corn in Missouri, Kansas, Oklahoma and in parts of the other states in this region amounts to about one-fourth of the total for the country. Cotton, rice, sugar cane, sorghum and a host of other



Trinidad station burns lignite, Wichita and Dallas natural gas, Neosho uses stokers, and many plants are oil fired

products make this territory of prime importance in the agricultural picture of the United States. Arkansas and Louisiana are leaders in pine lumber production, and the timber resources of the other states, such as Texas and Oklahoma, are considerable.

The mineral and allied resources of the region are tremendous. Oklahoma, Texas, Kansas and Arkansas are richly dowered with petroleum. Remarkably diversified mineral deposits also exist. Some are being worked, but most are not being developed at all. In the worked class are the zinc and lead deposits of Missouri and coal in some parts of Kansas and Oklahoma. Among the latent mineral riches of this country are the marble strata of Arkansas and the sulphur, graphite, quicksilver, diatomaceous earths, asphalt, lignite and the rare metals in Texas, Louisiana, Arkansas and Oklahoma.

During the past ten years the Southwest has been the scene of a widespread demonstration of the virtues and advantages of that politically criticised practice electric utility consolidation. Little evidence can be found that consolidated control and operation has been other than distinctly beneficial to the component utilities and the economic progress of the region in general. The great distances, the comparative smallness of communities, the frequent difficulties of obtaining adequate fuel and water for electric generation—all these and many other considerations make the Southwest an ideal territory for concentration of power generation at a few strategic points and for transmission to markets unfavorably situated for local or nearby generation.

One organization covers a major part of the states of Arkansas, Mississippi and Louisiana. Another spreads over as much of Texas as would comfortably contain four or five New England states.

The electric utility interests most largely represented in this region are the Electric Bond & Share Company, the Middle West Utilities Company, the Standard Gas & Electric Company, the Community Power & Light Company, the Cities Service Company, the North American Company and North American Light & Power Company.

State summations of generating capacities do not give a true conception of development in the Southwest, because scores of small plants are included, the total capacities of which amount to respectable figures. Many changes have involved the replacement of small plants by a few large generating stations, resulting in much higher system efficiencies. Some of these newer stations are: Tecumseh, Neosho and Wichita, in Kansas; Horseshoe Lake, Weleetka, Byng and Tulsa, in Oklahoma; Trinidad, San Angelo and San Benito, in Texas; Sterlington and Arsenal Hill, in Louisiana, and Remmel, in Arkansas.

Considering new developments in steam plant design, the 10,000-kw., 1,500-lb. turbine at the Northeast sta-

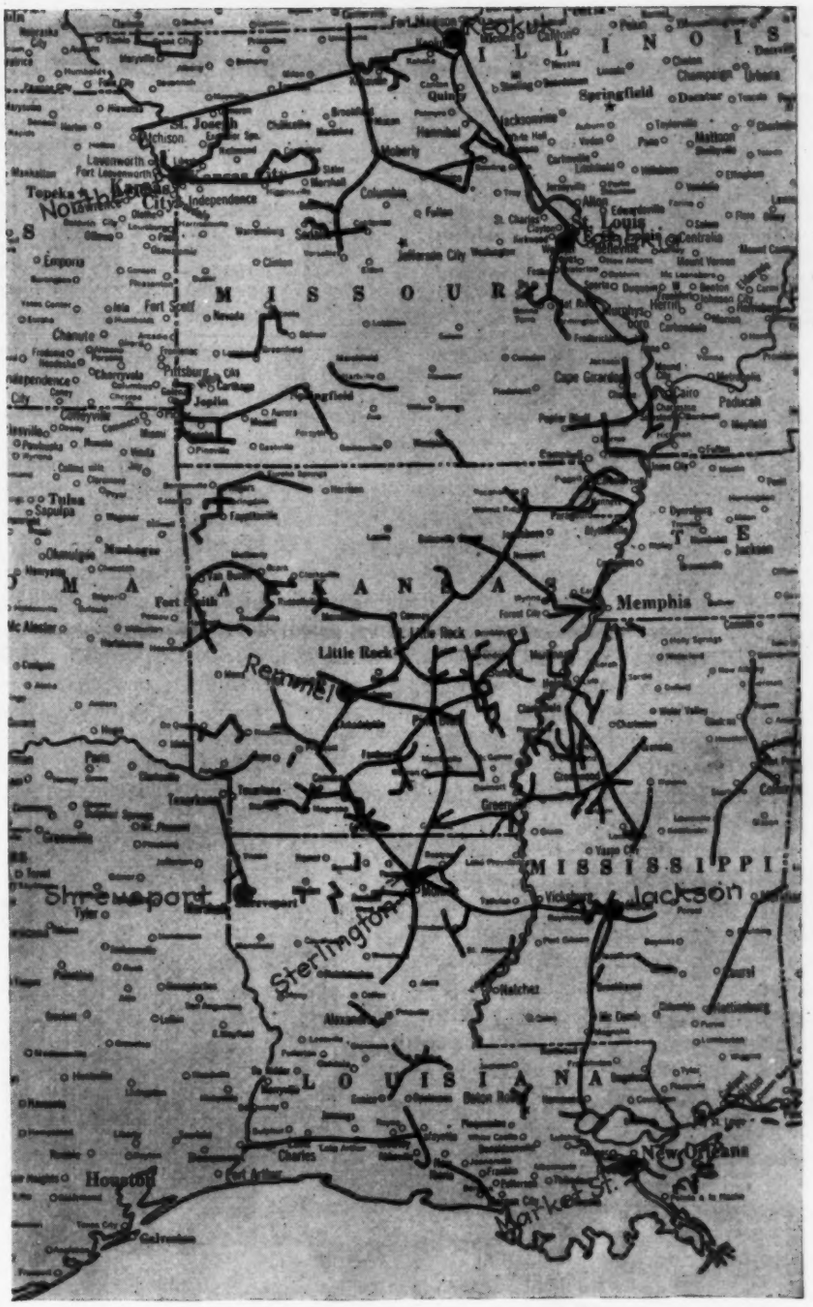
tion of the Kansas City Power & Light Company should not be overlooked. This machine will exhaust to the 350-lb. steam header. A project now under discussion by this company contemplates the installation of additional capacity in the recently absorbed 180-lb. street railway generating station, to operate at 700 lb. and exhaust into the 180-lb. header.

Among the stations in the Southwest, as elsewhere, there is wide divergence in fuels used and methods of firing. Pulverized coal systems, both unit and storage type, are to be found, as well as stoker installations. Neosho uses stokers on the new boilers; natural gas is burned at Wichita, Dallas, Sterlington; Trinidad uses powdered lignite, and a number of stations are oil fired. The performances of these stations over long periods average in the neighborhood of 18,000 B.t.u. per kilowatt-hour.

Most of the new stations are operated wholly on base load, the fluctuations being taken by the older and smaller plants remaining in the systems. Owing to the capacity effect of long transmission lines, power factor is easily maintained at close to unity. On one property the base-load station operates on Sundays and holidays at full kilovolt-ampere load and a leading power factor of 25 or below.

The amount of hydro power is not great in this region in comparison with the rest of the country. However, in the Ozark area in Missouri and Arkansas there are a number of promising hydro possibilities. Only one major project, at Remmel, Ark., has so far been developed. Above Remmel, on the Ouachita River, another project is under construction, and in the past few months the Insull interests have become associated with a projected development in Missouri. Texas also has a number of hydro power sites, some already developed and one on Devil River now under construction.

Of the present transmission network in this territory, probably not more than 10 or 15 per cent was in existence ten years ago. The increase of transmission mileage is due largely to the consolidation of independent properties, interconnection of contiguous systems, and development of natural resources, such as oil fields, mines, and quarries.



Northeast station uses 1,000-lb. steam; Remmel is a hydro plant; Sterlington burns natural gas

Although the systems in Missouri and Kansas are extensively tied together they are not so far flung as those in the five other states. Texas, for all its immensity, is practically covered by a continuous system of transmission lines. Oklahoma is crossed and recrossed with what amounts to a single transmission system, although quite a number of different companies are represented in ownership and operation. Extending north and south through Louisiana and Mississippi are the legs of a system that centers in Arkansas and nothern Louisiana.

A striking example of the value of interconnections between systems is furnished by the development of oil field load in Oklahoma. It also indicates a tangible value of holding company operation. At the beginning of the spectacular oil field rush of 1926-27 in Oklahoma it was not expected that the load would assume extraordinary proportions and no unusual provisions were made for it. But the success of the first few installations inspired more intensive and extensive selling effort and also caused a large number of oil operators to decide for themselves that they were going to have electric service if they could possibly get it. The result was that the peak demand on the utility system almost doubled inside of one year. Before the utility could increase its generating capacity it was imperative to supply energy from interconnected systems to the north, east and south. Meanwhile, the engineering and financial facilities of its parent company enabled the Oklahoma Gas & Electric Company to erect a new power plant and put it on the line in 85 days.

Population, Gross Revenues, Plant Values, Generating Capacity and Output for Seven States

	Population		Gross Revenues		Values of Plant and Equipment		Generated Kilowatt-Hours in Thousands		Generator Ratings, Kva.	
	1921	1927	1921	1927	1921	1927	1921	1927	1921	1927
Missouri	3,421,000	3,510,000	$22,650,000	$26,230,000	$138,368,000	$251,658,000	722,320	957,000	477,493	407,000
Kansas	1,782,000	1,828,000	13,050,000	20,980,000	83,536,000	121,681,000	415,230	806,000	179,288	342,000
Oklahoma	2,062,000	2,384,000	6,740,000	15,240,000	52,513,000	86,552,000	214,618	586,000	125,194	202,100
Texas	4,770,000	5,397,000	23,700,000	49,200,000	113,160,000	248,412,000	755,160	1,892,000	280,541	650,200
Louisiana	1,824,000	1,934,000	7,380,000	17,100,000	32,417,000*	55,629,000	235,091	657,000	105,205	226,200
Mississippi	1,790,000	1,790,000	1,939,000	1,743,000	15,235,000	24,292,000	61,806	67,000	51,466	27,000
Arkansas	1,783,000	1,923,000	3,905,000	5,380,000	34,788,000*	43,806,000	124,452	207,000	71,132	71,500
Totals	17,432,000	18,766,000	$79,364,000	$135,873,000	$545,709,000*	$832,030,000	2,528,677	5,262,000	1,290,319	1,926,000

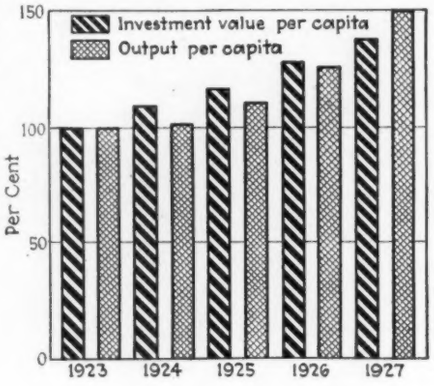
*No figures for 1921—these refer to 1923.

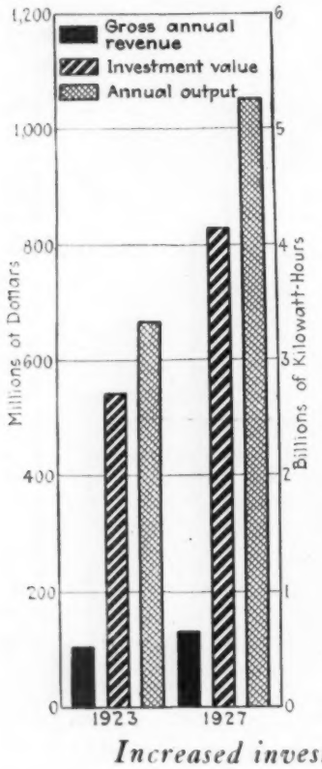
Between 1923 and 1927 the number of electric customers increased 14 per cent, to 97,168, but the connected load rose 100 per cent, to 254,476 kw., and the kilowatt-hour output skyrocketed 250 per cent, to 399,543,412, virtually 50 per cent more than the year before. The last two figures indicated the high load factor of the oil field load. To serve this load transmission lines had to be extended very rapidly. In 1923 there were 585 miles of line, whereas in 1927 there were 1,951 miles, 542 miles more than the year before.

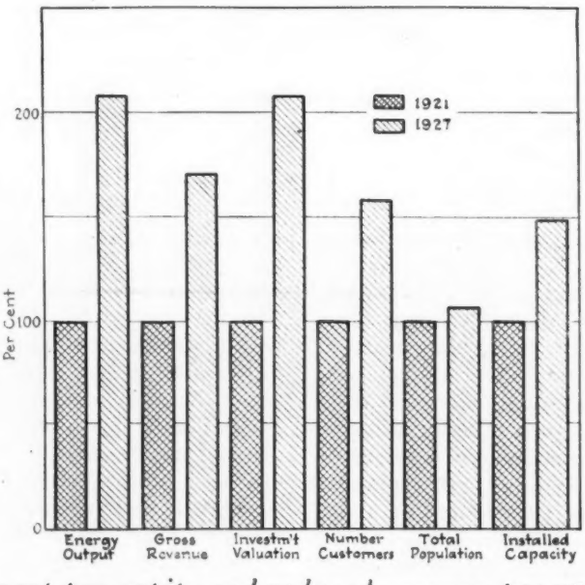
Other large systems of Oklahoma, Texas, Louisiana, Arkansas and Kansas can show similar records of growth. For example, one group of connected properties in Texas shows an increase of transmission mileage from 2,068 in 1925 to 5,296 in 1927. The system, earlier referred to, in Louisiana, Mississippi and Arkansas grew from 1,179 miles in 1925 to 3,145 in 1927.

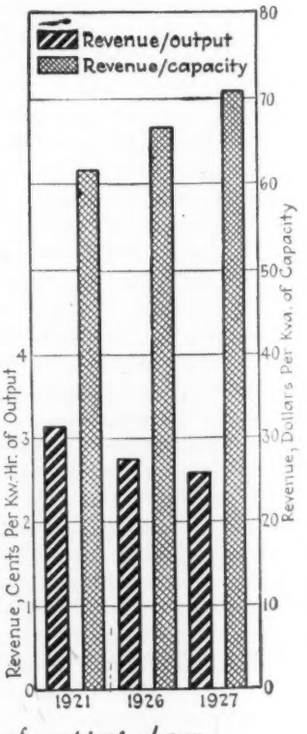
Utilities of the Southwest are endeavoring in various ways to stimulate and encourage new industries, to persuade new people to come into the region and to further their economic progress in every way. This work is done by all forms of publicity and sometimes by monetary help.

Practically all of the central stations in this territory have committed themselves to aggressive merchandising. Campaigns, house-to-house solicitation, special opportunities and other methods of getting the load on the lines flourish. Some companies have had rather disagreeable experiences with high-pressure selling, but the general opinion is that the fault was in the lack of control rather than in the method. In one Texas city domestic merchandise sales were pushed up to more than $40 per customer in 1927; a Kansas town reached $27. Sales of electric ranges are hampered in some localities by the cheapness of natural gas, which costs as low as 10 or 15 cents per thousand cubic feet of 1,100 B.t.u. gas. Refrigerators have had a wide sale on account of the long summer period and the difficulty, particularly in the small towns, of securing ice.









Increased investment per capita and reduced revenue per unit of output show Southwestern contribution to public

A Decade of Utility Progress

By Joseph F. Porter
President Kansas City Power & Light Company, Kansas City, Mo.

Joseph H. Porter

ELECTRICITY has played a wonderful part in the development of our country in the past ten years. There has hardly been in that period an industrial achievement of any kind to which electricity has not contributed in an important degree. It is one of the very few commodities, to my knowledge it is the only one, that has steadily decreased in price to the user, while other costs for material and labor have as steadily increased. With the exception of the farming population, and the job of bringing electric service to this group is going along with rapidly growing momentum, there is hardly an individual in the United States who has not, or cannot have if he wants them, all the benefits, comforts and conveniences that electricity brings to its users. The use of electricity in homes has been extended far beyond the expectations of former years, although as yet that use has nowhere approached its limit. The average residence consumption not so long ago was about 180 kw.-hr. per year; today it is 425—an increase of 136 per cent. This indicates the great possibility latent in the residential load, and a signal accomplishment of the last ten years has been the comparatively recent appreciation of the tremendous potentialities of that load. It has been no small achievement of the industry to convince its members of the potential importance of the residential load and that electricity could be used in the home, profitably to both customer and utility, for more than a few lights. The greater achievement of complete development of domestic electric service still lies ahead of us—ten, twenty years, who can say?

I have spoken first of electricity in the home because that affects more people than any other application and because it is relatively a new thing with us and because while the sum of our efforts in this direction to date has seemed large to us, it is small in comparison with what there remains for us to do. In the applications of electricity to commercial uses there has been much progress, progress not only in the greatly increased consumption of energy for common and familiar uses, but also a remarkable widening of the field of application. While mechanical power remains the most important outlet for electric service in industry, there have been many new applications that were unknown or little considered ten years ago. Chief among these newer uses is industrial heating, a field of service that according to some men who speak with real authority will eventually make the power load seem small in comparison.

In support of the foregoing general remarks there can be instanced the progress of the city and company with which I am naturally most familiar. In 1918 the peak load of the Kansas City Power & Light Company was 26,400 kw.; in 1928 it is, so far in the year, 120,806 kw., an increase of 458 per cent. In 1918 the energy generated amounted to 118,192,608 kw.-hr.; in 1928 it will be nearly 500,000,000, an increase of more than 400 per cent. In 1918 unaccounted for losses were 18.52 per cent; in 1928 they are 11.26. Taking into consideration this 39 per cent reduction in losses, the amount of energy sold in 1928 will be about six times the amount sold in 1918.

The past ten years in Kansas City has seen many changes in the generation and distribution of electricity. These changes have been the milestones of definite economic progress in the community. Among them are listed the replacement by many incandescent lamps of the few sputtering arcs that were only a short time ago the best that could be used for street illumination; the installation of transformer substations in residence districts in place of noisy converting machinery; the changing of the power system from 25 to 60 cycles; the building of a large new generating station; automatically operated substations installed throughout on both alternating- and direct-current distribution systems, and a host of minor improvements. All of these changes have been made with the single view of producing a more reliable service at a lower cost to the consumer because it is good business to do so.

These figures and this information on the Kansas City utility are not given because this company has performed exceptionally well in the past ten years. Some companies have done better and, by the same token, some have done worse. But there is no intent at comparison here; it is only desired to show the general progress by a specific instance. Looking back over ten years, the record of the power and light industry has been one of constant progress, efficient operation and fair treatment of customers and stockholders. Any company or industry that lives by these policies has built on a secure foundation. Adherence to these policies assures our continued success in the future. The increasing use of electricity in the home, on the farm, in industry and by the railroads is evidence of the development yet to come. Electricity is the most efficient, economical and convenient source of power. So long as it holds this position and so long as the business of its supply is managed according to the policies here recited the future holds for us continued development and continued success.

Letters from Our Readers

Matter and the Senses

To the Editor of the ELECTRICAL WORLD:

In regard to the interesting editorial entitled "What Is the Atom" in the April 28 issue of the ELECTRICAL WORLD I should like to submit the following comment, in the hope that you may find it worthy to publish. Perhaps confusion exists in regard to the terms matter and energy, and in order to clarify these concepts it is necessary to consider human sense perception. Is it not well agreed that there are planets of varying size, then bodies, substances, molecules, atoms and electrons? Are there not electrons in atoms, atoms in molecules, molecules in substances, substances in bodies?

Why not go on and reasonably argue that the electron is probably divided into smaller units, magnetrons, for instance. Just as electricity is the expression of moving electrons, then magnetism is the expression of moving magnetrons! Light is then moving electricity (electrons) in matter. Daylight is moving electricity in the earth's atmosphere. Heat is then moving magnetism in matter, especially in solid matter!

What is matter on the above basis? Matter is locked-in energy perceived through the human senses directly or aided with instruments! The electron is matter since it was identified through the oil drop experiment of Dr. R. A. Millikan. Matter is real because it is perceived through the senses unaided, as in the case of bodies and substances. Matter is real because it can be perceived by the human senses through the use of instruments, as in the case of planets, molecules, atoms and electrons!

What is energy on the above basis? The higher manifestations of energy are unlocked matter not humanly perceived, yet to be controlled, relocked into matter and put to work for mankind. Lower manifestations of energy are partially unlocked known matter.

For instance, solar energy is unlocked, unknown sun matter. Heat energy from a wood fire is unlocked known matter—wood. In the first case, the control that unlocks the energy is unknown to us. In the second case, the control is in the hands of mankind and involves fire and the process of combustion (oxidation). No one knows when fire was first started, but some one obtained the idea, from some source, of rubbing two sticks together. In other words, Prometheus stole fire from the Gods!

Ordinary matter is locked-in energy whose rate of radiation is so slow, from the standpoint of human sense perception, that the radiation is unperceived. For instance, a sheet of glass is matter which is locked-in energy. The radiation rate of this locked-in energy is too slow to be humanly perceived.

Higher orders of matter, for instance radium, are locked-in energy whose radiation rate is perceived by the human senses. All matter radiates energy; in other words, it is slowly or rapidly unlocking! The unlocking of energy from matter—energy radiation—and relocking of energy into matter again are all relative actions involving time and human sense perception. The higher orders of energy unlock and relock the lower orders, thus deforming and reforming matter. The control of this action is slowly vouchsafed to mankind in measure as such control is merited!

C. L. KASSON.
1165 Massachusetts Avenue,
Boston, Mass.

Dividends Paid on Profits, Not Volume

To the Editor of the ELECTRICAL WORLD:

The article "Profit vs. Volume in Pricing," by W. L. Churchill, that appeared in the March 24 issue of the ELECTRICAL WORLD has proved of interest to us as it must to every company engaged in present-day competitive selling. Many of us have fallen into the habit of thinking that business is good or bad depending on whether it is ahead or behind last year's volume. Let two business men meet and the first question is, "How's business?" and the next is, "How does it compare to last year?" How many times have you heard one business man ask another, "How're profits?"

Trying to beat last year is the great American business game, and it's quite worth while if the players will only remember to keep their eye on the ball of "Profits." When business becomes a mad scramble, as I am afraid it has, after volume, let profits fall where they may, we are headed for trouble.

Purchasers wise in the lore of tendencies, sensing the fight for volume, dangle large orders before salesmen and the lure is a "better price." The better price is always a lower price and a lower price is very often a profitless one, but, rather than a lost order, a lost profit is accepted. And so business finds itself in what may prove to be a vicious circle. Very often the purchaser is blamed because he takes advantage of a buyer's market and drives a neat bargain, profitless though it may be. And yet the purchaser is out to buy at the lowest figure and can never be sure the figure he has before him is the lowest until he tries the salesmen to find out. And the salesman, driven for volume and his company striving for the same thing, cuts and cuts, until there's no profitable margin left.

The purchaser must realize that after all is said and done business to be mutually profitable must be done on a live and let live basis. He must have confidence in the companies he wants to do business with and, having that confidence, concede to those companies a fair profit on the merchandise he buys, just as he expects to make a fair profit on the merchandise he sells. This thought is admirably summed up in a recent advertisement of the Western Electric Company. Speaking of itself as a buyer of the Bell System, it says: "It (the Western Electric Company) must buy at prices which are fair to the Bell System. It must buy at prices which are fair to the seller, because he must be able to continue in business and prosper, to remain a reliable source of supply."

If every purchaser of electrical equipment in this country had a platform of that character, most of the ills spoken of by Mr. Churchill would disappear.

The seller, too, should have a platform. He should throw away his target of volume and drop his sights to profit. He should, as he does, charge a fair price for his goods and his service and take no business that returns no profit. That may be Utopia, or may be achieved in the millennium. I think it will be achieved when shrinking yearly profit balances will drive business to the realization that following blindly after volume is following the will-o'-the wisp that can lead only to disaster.

We in our company are trying to build a business on payment received for service rendered and merchandise delivered. We know that dividends are and can be paid only on profits, not volume.

ALBERT L. SALT,
President.
Graybar Electric Company,
New York City.

Digest of Electrical Literature

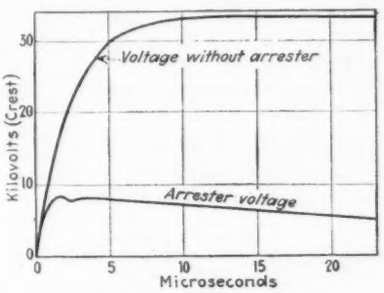
Generation, Control, Switching and Protection

Heat Losses in Direct-Current Armature Conductors.—W. V. LYON, E. WAYNE and M. L. HENDERSON.—The authors have endeavored to indicate that it is incorrect to assume, while there are extra losses in the armature coil of a direct-current machine when it is undergoing commutation, that during the major portion of the time, since the current is steady, the loss in the coil is correctly computed by squaring the value of the current and multiplying by the true or ohmic resistance of the coil. The disturbance in the coil current produced by the process of commutation persists throughout the cycle, so that at no time is the current uniformly distributed over the cross-section of the conductor. Although the disturbance and resulting extra loss factors are greatest during commutation, the extra losses are present at all times, even while the current in the coil is steady. The procedure for determining extra losses is given and the case involving several coils side by side is likewise considered. It is also suggested that it is more important to laminate and properly arrange the armature conductors of a large direct-current generator than it is to do so in the case of an alternating-current machine.—*Serial No. 552 Publications from the Massachusetts Institute of Technology,* March, 1928.

Protection of Supervisory Control Lines.—EDWARD F. W. BECK.—Supervisory control lines used in the remote or automatic control of electric plants are subject to overvoltages dangerous to insulation and to operators. These overvoltages may be caused by lightning, crosses with the power lines or induction from them. Open wire control lines are influenced by all of these, cables with grounded sheaths are immune to disturbances caused by lightning or other electrostatic induction and are more or less safe from crosses. The ordinary cable is still subject to high voltages by electromagnetic induction when a fault occurs on the power line. These voltages may be dangerous not only to apparatus but also to the cable insulation. Protection by means of lightning arresters is therefore necessary. Calculations show that even if the apparatus locations are protected, high voltages may occur along the lines if the transmission line fault is between stations. This may cause a cable failure, so that it is advisable to protect the cable at certain intervals. Supervisory control protectors may be called upon to discharge heavy currents of appreciable duration. This requires extremely sturdy arresters and the conditions are met by a spark gap of a special design operating in argon at a reduced pressure. The author suggests that specially made cables will shield the line from extraneous disturbances and that in large installations such precautions may prove desirable. — *Journal of the American Institute of Electrical Engineers,* May, 1928.

Transmission, Substations and Distribution

Protection of Station Equipment on High-Voltage Transmission Lines. — K. B. MCEACHRON.—An interpretation of the effect of transient voltages on transmission lines and transformers has been undertaken by the author. Extensive consideration has been given to: Impulses due to overvoltages induced by lightning; insulator flashover characteristics and phenomena; the insulation of lines and transformers, and to lightning arresters both as regards the line and location for best results. The author concludes that in designing a high-tension system careful consideration must be given to all of the factors affecting the protection of the system against lightning. The effect of high towers, long spans, high line insulation, transformer and bushing strength and a proper relation and balance of the values involved must be considered so that no part of the system will be unduly stressed. — *General Electric Review,* May, 1928.



Effect of lightning arresters on voltage-time characteristics

Hydro-Electric Development and Steam Equipment

Characteristics of Modern Stokers.—F. H. DANIELS. — The characteristics demanded of modern stokers and the manner in which these requirements are met by the travelling grate and multiple-retort underfeed types has been outlined in a discussion of the several methods of securing the desired results. A consideration is offered of the plans for securing air control along the length of the retort and of duplex firing of multiple-retort underfeed stokers. The advantages of utilizing water tube furnace walls has been considered and the economic considerations involved in their application to generating station use have been reviewed. In connection with the duplex firing scheme involving the use of pulverized fuel and stoker feed in the same combustion chamber it is stated that the only increase in cost would be the price of the unit pulverizer and burner and that this would easily justify itself by reason of the increased capacity obtained from the boiler during peak hours. The tendency of the stoker to show a large drop in efficiency at high capacity would be largely offset and it would not be necessary to sacrifice economy to get capacity.—*Transactions of the American Society of Mechanical Engineers,* January-April, 1928.

The High Cost of Fuel Saving.—W. TRINKS.—A comparison of the progress in engineering with the tendency toward fuel saving is offered by the author. Some of the reasons for hesitating to adopt new equipment that will save a large percentage of fuel wasted by the older methods are pointed out. It is indicated that in most cases it is less expensive in the long run to retain the old equipment than to install the latest types with their economies. Mention is made of analogous practices in other fields.—*Transactions American Society of Mechanical Engineers,* January-April, 1928.

Units, Measurements and Instruments

The Flow of Viscous Liquids Through Pipes.—A series of charts for use in examining the various factors involved in the flow of viscous liquids through pipes is presented in this discussion. One permits the determination as to whether the flow will be viscous or turbulent, another develops a stream-line consideration, and the other two, which are particularly applicable to turbulent conditions, may be applied to graphical determination of the several terms in the equation developed by Prof. C. H. Leeds for such work. — *Engineering (England),* April 27, 1928.

Demand Metering Equipment. — STANLEY STOKES and LESLIE V. NELSON.—The authors have considered the special applications involved in the development of demand metering equipment. Public utilities supplying electric power are continually finding themselves confronted by problems a little different from anything in the past. New interconnections with superpower plants, and transmission lines often present involved metering installations. The one herein described has to do generally with such a condition and specifically has to provide for metering the simultaneous composite demand of an ultimate installation of 48 separate feeder circuits. It is believed that this is the largest installation of its kind so far attempted. The importance of this particular job required a very exacting study of all

of the factors and the operating results to date appear to be entirely satisfactory. A novel scheme has been incorporated in the daily routine of handling the demand meter tapes. A general description of this is given and a few details of the physical installation are cited, which show the extreme care used throughout the whole installation. While this application is specifically designed for metering, the principles involved are applicable to numerous other uses, some of which are mentioned.—*Journal of the American Institute of Electrical Engineers*, April, 1928.

Motors and Control

Power Requirements in Cotton Mills.—H. H. Bodge.—The power requirements in the various phases of cotton mill activity are reviewed in connection with process characteristics. A tabulation of the power requirements for the many types of machines required for this work has been included.—*Electrical News* (*Canada*), May 1, 1928.

Heat Applications and Material Handling

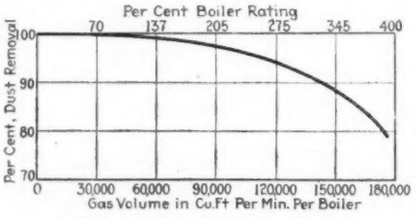
Industrial Electric Heating Installations.—The Industrial Heating Committee of the N.E.L.A. has issued a serial report superseding previous publications issued by the same division. The heating operation, product, plant, heating equipment, size, insulation, operating temperature, heating cycle, load in pounds, pounds per kilowatt-hour, the form of heating replaced by the electric application, the responsibility for the installation and the manufacturing results, user and central station factors, and several others, are considered for a number of installations dealing with the melting of metal, hardening and carburizing, annealing and normalizing, tempering, handling of vitreous enamel, baking of enamel and Japan and the baking of cores, and miscellaneous installations.—*Report National Electric Light Association*, April, 1928.

Arc-Welded Steel-Frame Factory Building.—Frank P. McKibben.—In connection with a description of the construction methods used in erecting an electrically welded steel-frame factory building, the author has suggested that this process is to be recommended for general use in the welding of bridges and buildings, but that application should be confined to responsible designers, fabricators and engineers who may apply it only where it has well-defined advantages over any other known method of building and who will exclude it where not suitable. Several problems arising in connection with such work are mentioned, including the necessity for securing building codes which will permit the use of welded construction, the need for a simple, practical series of accomplishment tests for use in employing welders on important work, more extensive use of jigs in fabricating shops to reduce cost of assembling, automatic welding machines depositing continuous or intermittent fillets which should be further developed to reduce construction cost and detail standardization which should be effected to facilitate the adoption of structural welding practices to general use.—*General Electric Review*, May, 1928.

Electrophysics, Electrochemistry and Batteries

Electroplating on Aluminum and Its Alloys.—Harold K. Work.—It is stated by the author that electroplates of most metals on smooth aluminum surfaces are of doubtful value unless heat treated. Plating on a roughened surface is recommended as being a practicable procedure. Methods of plating the common alloys are given. A dip is described for commercially pure aluminum which roughens the aluminum and simultaneously forms an immersion layer on the surface. For alloys containing an eutectic network, a dip which attacks one constituent of the network is advised. Where strong alloys are plated an excellent product is easily obtained, providing the alloy has been subjected to the usual heat treatment to develop its strength.—*Report of American Electrochemical Society*, April, 1928.

Electrical Precipitation.—A. Grounds and H. W. C. Henderson.—A general outline of the several methods of securing electrical precipitation of solid material in gaseous suspension is considered by the authors. Practical applications to industrial problems and to the elimination of the dust from stack gases are given. The efficiencies and the practices adapted at the generating station of a large utility are outlined in connection with this discussion.—*Electrical Review (England)*, April 20, 1928.



Efficiency of dust removal at pulverized fuel plant

Telegraphy, Telephony, Radio and Signals

Propagation Characteristics of Sound Tubes and Acoustic Filters.—W. P. Mason.—The process of measuring the propagation characteristics of uniform sound tubes and acoustic filters is complicated, according to the author, by the reflections which may occur at the ends of these structures. The present discussion applies some theoretical considerations in connection with the effect of these reflections. In making the measurements, the testing device involved is inserted in an acoustic transmission system, and the resulting changes in the magnitude and phase of the transmitted wave are measured. The actual observations are made in electrical circuits connected with the terminals of the acoustic system by loud speakers. The impedance of the acoustic system at the point of insertion is made an acoustic resistance. For measurement on straight tubes, these resistances as used are of such value as to prevent any appreciable reflections from the ends of the tubes. The results of the measurements indicate that the Helmholtz-Kirchoff law is invalid, while the results of measurements on acoustic filters are in good agreement with the theoretical results previously obtained.—*Reprint B-295, Bell Telephone Laboratories, Inc.*

Electrical Measurement of Communication Apparatus.—W. J. Shackelton and J. G. Ferguson.—A description of precision high-frequency measurements of a fundamental type, with special emphasis on measuring circuits rather than on the types of apparatus measured. Standards of frequency, resistance, capacitance and inductance are briefly discussed. Bridge measurements are described for the measurement of frequency, inductance, effective resistance, capacitance, dielectric loss, capacitance balance and inductance balance. Circuits for the measurement of other high-frequency characteristics such as attenuation, gain and cross-talk are included.—*Reprint B-294 Bell Telephone Laboratories, Inc.*

Miscellaneous

A Metallographic Study of the Path of Fatigue Failure in Copper.—Herbert F. Moore and Frank C. Howard.—The study of the failure of metals under repeated stress, commonly known as fatigue, has usually been carried on by means of mechanical tests of strength. The present investigation involves the metallographic examination of the nature and mechanism of the progressive fracture which apparently constitutes fatigue failure. As a result of this investigation the authors conclude that etching with concentrated nitric acid brings out the intra-granular structure consisting of laminas separated by planes especially sensitive to chemical attack; specimens of rolled copper, subjected to repeated flexure until a fatigue crack develops, show a surface disturbance of the metal in the vicinity of the crack; the surface disturbance is visible in micrographs of unetched specimens by lines; the rolled copper tested had in it so few inclusions that any tendency of the crack to take a course from inclusion to inclusion was not in evidence, and that specimens of rolled copper etched after the development of a fatigue crack showed no evidence of any change in crystalline structure and that after the surface had been eaten away by the etching reagent the disturbed region in the vicinity of the crack was much less in evidence than on the unetched surface.—*University of Illinois Bulletin*, May 15, 1928.

News of the Industry

N.E.L.A. Program in Final Form

O. W. Knauth, Department-Store Merchant, and C. E. Paige, Gas-Company Official, Added to Those Who Will Address the General Sessions

COMPLETING the program of the National Electric Light Association as printed in the ELECTRICAL WORLD last week (page 1031), there will be two addresses not previously included—one on "Fundamentals of Electrical Merchandising," by Oswald W. Knauth, vice-president R. H. Macy & Company, New York, to be given at the second general session, on Wesdnesday morning, June 6, and the other on "Accident Prevention," by C. E. Paige, vice-president Brooklyn Union Gas Company, to be given at the third general session, on Wednesday afternoon. The address on "Government and Business," by John E. Edgerton, president National Association of Manufacturers, has been transferred to the third general session. It was previously scheduled for the first session.

The following titles have been selected for general-session addresses previously not designated otherwise than by the name of the speaker or by a general title since made more specific: Tuesday morning, "Radio's Relation to Electric Light and Power," H. P. Davis, chairman of board, National Broadcasting Company; Thursday morning, "The Decentralization of Industry," Governor Dan Moody of Texas; Thursday afternoon, "Labor's Part in Electrical Development," Hugh Frayne, American Federation of Labor; Friday morning, "The Power Industry in the Marketplace," James H. McGraw, president McGraw-Hill Publishing Company.

Senator Wagner Introduces Anti-Federal Court Bill

Another bill has been added to those pending in Congress designed to restrict the jurisdiction of federal courts in cases affecting the rates charged by public utility companies. Senator Wagner of New York is the father of the new measure, which sprang from the decision of a United States statutory court allowing the Interborough Rapid Transit Company of New York City to increase its fare. The postponement last Monday until October by the United States Supreme Court of argument on the appeal from this decision will probably operate to prevent any vigorous agitation over the proposed legislation at this session of Congress.

Senator Wagner argued that the local utilities are created by the state and receive permission to do business and get their special franchise and monopoly privileges from the state or municipalities. He declared that the source and right of all the utility powers is in the state. "But," he added, "when their duties are in question the utilities are showing a marked preference for the federal courts and an antipathy to the jurisdiction of the state courts. Through their ability to raise the constitutional question local public utilities have been able to exercise choice and thereby to secure an advantage over the municipalities and residents of the communities wherein they do their business. There is to my mind no sound reason why a local public utility should have the advantage of a choice between two systems of law and two sets of judges."

Conferees Agree on Muscle Shoals

Their Bill Goes a Step Farther than the House Measure to Put Government Into Business—School Issue Looms Large in Trade Commission Inquiry

By PAUL WOOTON
Washington Correspondent of the ELECTRICAL WORLD

SUCCESSFUL negotiation over the Muscle Shoals bills in conference between the two houses is announced by Senator Norris, father of the original Senate measure. After the House of Representatives had narrowed the scope of the business activities into which the government is launched by the proposed legislation, the conferees rewrote the bill in a form more objectionable to industry than the measure reported by the House committee. Under the conference bill the "Muscle Shoals Corporation of the United States" is directed "to operate existing plants" and to construct, maintain and operate experimental or producing plants at or near Muscle Shoals for the manufacture, distribution and sale of fertilizer or any of the by-products of the same.

As this is written, the general expectation on Capitol Hill is that the President will veto a measure which some of its opponents go as far as to term a "naked and unashamed attempt to establish communism in the United States as a national policy." The large vote for the measure in each house is explained on the ground that Congress is anxious to get rid of Muscle Shoals and on the ground that many votes were obtained through "trades" on flood control, farm relief, Boulder Dam and other measures.

Just as the legislation provides for the setting up of the government in the fertilizer and chemical businesses, it also thrusts Uncle Sam into the power business and introduces the Federal Power Commission as a regulating body in the several states where Muscle Shoals power will be sold. The new federal agency is directed to sell power to states, counties, municipalities, corporations, partnerships or individuals, and must give preference to "states, counties or municipalities purchasing said current for distribution to citizens and customers." The bill provides that power is to be distributed equitably among the states within transmission distance of Muscle Shoals. This insures its dissemination into a number of states. Wherever any Muscle Shoals power, regardless of how small the quantity may be, is intermingled with other power the Federal Power Commission is to determine a reasonable, just and fair price which the ultimate consumer is to pay.

The measure also authorizes the construction of the Cove Creek dam across Clinch River and the installation of equipment sufficient to generate 200,000 hp.

UTILITIES AND THE SCHOOLS

Testimony taken thus far before the Federal Trade Commission reveals that representatives of the public utilities have been extremely assiduous in getting views held by the industry before students in schools and colleges. Some take the view that certain of the methods employed in this connection were questionable. It was apparent, too, as concerns utility representatives' efforts in general to promote the cause of private ownership with the public and with legislators, that a particularly bad impression was made in the instance where no record of payments had been kept and in another instance where the records had been destroyed.

On behalf of the utilities it is explained that pamphlets furnished educational institutions are not textbooks in the usual conception of the term. Since an industry subject to public regulation is peculiarly dependent upon an intelligent understanding of its affairs by the public, it was felt that every effort should be made so that the rising generation would have a grasp of the complexities of this highly technical industry. In this connection it is contended that this constitutes a thoroughly ethical type of public relations, as is evidenced by the use of those methods by trade associations, banks, insurance com-

panies and other commercial activities.

Attention is called to the fact that a few years ago the electrical industry necessarily was entering upon new forms of corporate, financial and industrial organization. It was new to the people, just as the chain-store problem, for instance, is today. It was necessary to acquaint the public with these departures before there could be hope of their favorable reception. Moreover, it was found that instructors in schools and in the academic classes generally were inclined to be ultra-conservative and disinclined to approve the methods that went along with the necessity of trebling the per capita production.

The testimony before the commission has been perfunctory, for the most part. Well-known facts and conditions have been reviewed so that they may be formally before the commission in the record. One of the outstanding developments of last week was the testimony of Representative Douglas of Arizona, who attempted to put into the record material indicating the extent of the activities of the Los Angeles Bureau of Power and Light in an effort to put forward the municipal point of view. The material was ruled out, but it is believed that before the case is closed there will be a comparison of the methods employed by the utilities and by the advocates of public ownership. As the commission is required to recommend remedial legislation, it is thought that the other side of the picture must be shown to enable it to judge the general situation.

Trade Commission Investigation Resumes Monday

Nothing of a new or startling nature was developed at the utility hearing of the Federal Trade Commission last Thursday, May 17, when S. E. Boney of the North and South Carolina Public Utilities Information Bureau gave testimony on lines now familiar concerning the publicity and educational efforts of that body. When the inquiry resumes next week, after a ten-day recess, officials from the New York State, Minnesota and Colorado bureaus will be examined as well as C. H. B. Chaplin, secretary of the Empire State Gas and Electric Association, whose evidence is scheduled for Monday.

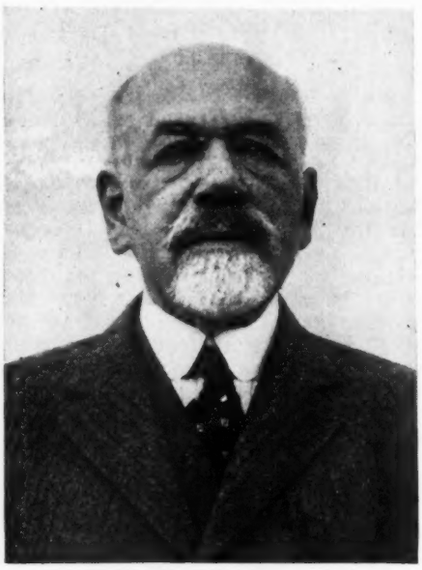
Chicago Home Rule Bills Are Rejected, 49 to 17

The traction bills, to consider which the Governor of Illinois called a special session of the General Assembly, as reported last week, and which would have given Chicago home rule over its public utilities, were killed in the Lower House on Tuesday. A motion to postpone consideration was carried by 49 to 17. Declaring that there is no hope of giving Chicago public utilities home rule at this time, Representative Michael Igoe of that city denounced Governor Small and Mayor Thompson as those responsible for the failure.

Felix Deutsch Dead

Head of A.E.G. Expires Unexpectedly in Berlin Two Days After Celebrating His Seventieth Birthday—Forty-five Years in Electrical Manufacturing

CABLE dispatches from Berlin received on Saturday, May 19, told of the sudden death from heart trouble on the day before of Dr. Felix Deutsch, head of the Allgemeine Elektricitäts-Gesellschaft, whose seventieth birthday anniversary on May 16 had brought forth congratulations from President von Hindenburg and Chancellor Marx of the German Republic and from prominent industrial leaders in Germany and other countries. At that time Dr. Deutsch was reported to be in excellent health. Only last October he visited the United States for the first time, and



Felix Deutsch

an interview with him on the progress of the German electrical industry was printed in the ELECTRICAL WORLD (Oct. 15, page 801).

With Emil Rathenau, Felix Deutsch was one of the founders of the German Edison Company forty-five years ago, and his life career was bound up with the growth of the German electrical industry from the smallest of beginnings to its present magnitude. For years he himself traveled almost continuously in developing markets for the A.E.G., the great manufacturing company which grew out of the German Edison Company. He succeeded Rathenau as head of this company. To him was due in large measure its successful weathering of war and post-war conditions, and last fall Dr. Deutsch was able to report that the company had in hand orders for steam turbines with an aggregate rating of 1,000,000 kw.

Dr. Deutsch was a Privy Counselor of Defense for Germany. He won distinction outside of business circles through his love for music and other arts, to which he contributed time and money. His judgment was sought by his government in international affairs. He urged renewing relations with the United States immediately after the war and was a prominent adviser in Germany's trade relations with Russia. He was a member of more than forty executive committees of commercial enterprises.

Congress Votes Gold Medal for Thomas A. Edison

A joint resolution authorizing the Secretary of the Treasury to strike off a gold medal in commemoration of the achievements of Thomas A. Edison was adopted by the House of Representatives last Monday. Duplicate medals in bronze are to be made and sold at a price sufficient to cover the cost.

In reporting the resolution, which was introduced by Representative Perkins of New Jersey, the House committee on coinage, weights and measures estimated the monetary value of industries entirely based on the inventions of Edison or materially stimulated by his inventions at $15,599,000,000, distributed as follows: Motion pictures, $1,250,000,000; telephones, $1,000,000,000; electric railways, $6,500,000,000; electric lighting, $5,000,000,000; electric supplies, $857,000,000; fixtures, $37,000,000; phonographs, $105,000,000; car shops, $109,000,000; dynamos and motors, $100,000,000; batteries, $5,000,000; concrete, $271,000,000; telegraph, $350,000,000; wireless telegraph, $15,000,000.

Toronto Hydro Commission Defends New Rates

In a report submitted to Mayor McBride of Toronto in reply to queries from him regarding the increase and adjustments in the rates for electrical energy of the Toronto Hydro Commission, that body says among other things:

"The idea that the new rates penalize the small householder at the expense *(sic)* of the larger householder is erroneous. Under the new rates 65,500 consumers in six-room houses and under will pay on the average 22 cents per month more for their consumption; 17,500 consumers in seven-room houses will average 32 cents more per month; 17,200 consumers in eight-room and nine-room houses will average 37 cents more per month, and 5,500 consumers in ten-room houses and over will average from 52 cents to $1.28 more per month. In no case where a small consumer takes 30 kw.-hr. per month or less can he pay more under the new scale than under the old."

Arkansas Utilities Association Elects Officers

The Hot Springs convention of the Arkansas Utilities Association, held last week and noted on page 1029 of the ELECTRICAL WORLD, came to a close on May 16, when the following officers were elected: President, W. E. Bann, general manager Western Gas & Elec-

tric Company, Texarkana; first vice-president, R. E. Ritchie, Pine Bluff; second vice-president, G. W. Skow, Huntington; secretary-treasurer (re-elected) Rex I. Brown.

Two speakers from outside the utility ranks were Joseph Leopold, manager Southern Central Division of the United States Chamber of Commerce, who charged the average business man with failure to do enough thinking on questions of vital national importance, and D. Hodson Lewis, manager of the Little Rock Chamber of Commerce, who urged the need of a research bureau to aid in the industrial development of the state. Harvey C. Couch, president Arkansas Power & Light Company, was the chief speaker at the banquet. He dwelt upon flood control, in which he is taking a prominent part.

A.E.C. Board Acts on Boulder Dam and Other Matters

At a recent meeting in Milwaukee, the administrative board of the American Engineering Council indorsed the creation of a commission of engineers as proposed in the Douglas bill to investigate the physical problems connected with flood control and development of the Colorado River. The program contemplated by the Douglas bill was approved "subject to the report of the aforesaid commission," present expenditures on the Colorado River to be confined to flood protection.

Arthur W. Berresford, president of the council, reported to the board the council's activity in the Mississippi flood legislation and presented the report of the committee on Boulder Dam, headed by Francis Lee Stuart of New York, which unanimously decided against the engineering feasibility of the proposal outlined in the Swing-Johnson bill. President Berresford also told of the progress of the movement to transfer to the Department of the Interior the public works functions of the government. The council has been energetically supas the Wyant bill. Government officials and departments, especially the Engineer Corps of the army, are, however, strongly opposed to the bill, and it has little chance this session.

A proposed amendment to a joint resolution passed by Congress in 1919, "for the purpose of promoting efficiency, for the utilization of the resources and industries of the United States," was opposed. "This resolution," Executive Secretary L. W. Wallace explained, "has to do with the so-called Garabed free energy generator. This question has been before Congress in every session in some form or other during and since the war. The American Institute of Electrical Engineers from time to time has urged the council vigorously to oppose this. The council's committee on patents has likewise acted. The intent of this legislation, as expressed in bills in previous sessions of Congress, has been opposed by the council. In the light of such authorization, the executive secretary wrote to a number of the members of the House of Representatives pointing out the fallacy of granting such a privilege and seeking their active opposition. The resolution has been favorably reported by the patent committee of the House and is now on the House calendar."

Revised Report on Muscle Shoals Measure

Bill Recommitted by Senate to Conferees, Who Make Important Change in Provision Regarding Manufacture of Fertilizer—Power Clauses Unchanged

DISPATCHES from the Washington correspondent of the ELECTRICAL WORLD received as it closes its forms and supplementing his letter on page 1113 (already on the press) say that after it had been found that the Senate would not approve the original conference report on the Muscle Shoals bill, which provided for the manufacture of complete fertilizer on a commercial scale, the confereees were instructed to bring in another report limiting operations to manufacture on an experimental scale. The authority to distribute and sell fertilizer, or any of the byproducts of its manufacture, was eliminated. The provision for the construction and operation of new plants and facilities was stricken out, and the policy of the government in the utilization of the Muscle Shoals properties was declared to be for the fixation of nitrogen for agricultural purposes. No change was made in the power provisions of the bill, and the construction of the Cove Creek reservoir is provided for in the second conference report, as in the first.

It was estimated that the conference bill first presented to the Senate could muster only twenty votes. In addition to the fertilizer and Cove Creek provisions, it is thought that many Senators had come to realize that it would be difficult to dispose of the surplus power to advantage under the terms of the resolution. Any lease of power would have to contain a clause providing for its recall, should it be needed for fertilizer production. Under the conditions set up by the bill it was evident that the surplus power would have to be sold at dump prices. There also was objection to the preference accorded municipalities. The bringing in of the Federal Power Commission as a regulatory authority also aroused opposition on the ground that it would infringe upon the regulatory activities of the several states. Despite all of these objections, however, the conferees, as just stated, made no changes in the power provisions of the bill, which now awaits a final vote.

Debate Rages on Boulder Dam Bill

Arizona's Congressmen Fight Valiantly Against Its Passage—Douglas Dwells Upon Engineering Difficulties and Economic Phases—Receives Ovation in House

DEBATE on the Swing-Johnson Boulder Dam bill raged in both the House of Representatives and the Senate on Tuesday, May 22. In the House chief attention was attracted to Congressman Leatherwood of Utah, who made a sensational speech, vigorously attacking the bill, the Los Angeles municipal government and William R. Hearst. The latter he accused of using his newspapers to misrepresent the Boulder Canyon project and in an attempt to benefit the Los Angeles Bureau of Power and Light, with which the Congressman said Mr. Hearst is allied, at the expense of the federal taxpayer. He called the Swing-Johnson proposal "an attempt at a deliberate steal for the benefit of a political group in southern California, for the benefit of the real estate speculator in California and for the benefit of newspapers owned by William Randolph Hearst."

In the Senate, after Senator Johnson, sponsor for the bill in that chamber, had paid his respects to Senator Smoot, a leading opponent, and charged him with obtaining some of his material from "the great power interests," Senator Hayden of Arizona made an extended speech, again advancing his three objections to the legislation. The bill, in his opinion, is an attempt to coerce sovereign states, provides for an unjust division of the waters in the lower basin and fails to compensate Arizona and Nevada for the use of their resources for the benefit of California.

Opponents of the bill were further cheered in the House on the following day when an ovation marked the conclusion of a speech by Representative Douglas of Arizona against the bill. Mr. Douglas made the point that insurmountable physical difficulties exist at the proposed site and urged that further engineering studies be made before public funds are wasted in an effort to accomplish an impossible task. He explained that the excavation would require a movement of material comparable with that handled in the operations of the Utah Copper Company. To accomplish that task under the limitations of the terrain and the short working season, he declared, would require a superhuman effort. Mr. Douglas also dealt at length with the economic phases of the problem and made the point that Secretary Hoover never had passed upon the cost estimates or the details of the project.

Effective speeches in favor of the bill were made by Representative Burton of Ohio, who argued that an im-

provement of such vast importance should not be delayed because of the failure of one state to join with the others in the basin, and by Representative Crail of Los Angeles, who declared that the coastal cities of southern California will enter into contracts with the government to purchase all of the power that can be developed at Boulder Dam and that every dollar would be returned to the Treasury. He took issue with the contention that Boulder Dam power would not be able to compete with that generated by steam, pointing out that the nearest coal fields are 800 miles from Los Angeles and maintaining that petroleum cannot be depended upon as a permanent source of boiler fuel.

Hoosiers Discuss Vital Power Problems

Joint Convention at Indianapolis Takes Up Questions of Policy—Opposition to Government Encroachment—Public Relations and Rural Service

INDIANAPOLIS was the meeting place on Tuesday, Wednesday and Thursday of this week of the annual joint convention of the Indiana Public Utilities Association, the Indiana Electric Light Association and the Indiana Gas Association. These bodies united in a dinner on Wednesday evening, at which the chief address was made by William H. Onken, Jr., editor of the ELECTRICAL WORLD, who took as his themes the inability of the government to perform economic functions with any measure of profit or service to citizens, the national development and prosperity that have followed upon the enabling legislation of a generation ago as distinct from the hampering and crippling of business that he saw threatened by actual and impending disabling legislation of the present day, and the apparent incapacity of many people to discern the difference between political ambition and disinterested service. These points and others which he held to be vital and important to the country as a whole, as well as to the electric light and power industry, now under investigational fire, were effectively set forth by the speaker.

The meetings of the Electric Association got under way with an address by its president, R. M. Feustel of Fort Wayne, who asserted that the present occupation of this and similar bodies must be with matters of policy. This idea was amplified by T. F. English, president of the Great Lakes Division, N.E.L.A., who stressed the point that the electric utility business rests on a mutual interest of the public and the utilities, the one to be served fairly and economically and the other to enjoy freedom to work out its problems.

An opinion that farm service can be profitably undertaken on the basis of $120 per year from each customer was expressed confidently by G. C. Neff, who instanced the experiences of his own company in urging upon those present the necessity both social and economic for the development of this class of business. In the same strain C. V. Sorenson told of rural electrification progress and plans in Indiana. Specific instances of electrical applications to farm uses were discussed by T. E. Heinton of Purdue University.

A paper entitled in the program "A Few Comments on Commercial Activities," by W. H. Sammis, resolved itself into a comprehensive presentation of the aims and accomplishments of the Great Lakes Commercial Section. The session closed with a short but pertinent address by Harry Wenger, chief engineer of the Indiana Public Service Commission.

The second day of the convention, which was given over to the activities of the Indiana Public Utilities Association, was one of continuing interest. After the address of President A. W. Brady, advances in the art of accident prevention were described by W. R. Hirst. Harvey Harmon, a member of the Indiana Public Service Commission, then spoke on the subject of regulation. His remarks were pointed by the citation of manners and ways in which utility companies could improve their relations with the public.

Miss Theresa F. Carroll, chairman of the women's committee of the Great Lakes Division, outlined the work of this committee. Quoting President Coolidge's now historic remark concerning government in business, John B. Malling made a well-reasoned argument against public ownership based on the intention of the framers of the Constitution of the United States to fit that instrument to the changing conditions of future generations. Finally, Morse Dell Plain emphasized the need for proper training of those engaged in company management and supervisory functions. As management expects from workers a proper fulfillment of their duties, so the workers have a right to expect from management understanding supervision and control, he said.

New officers elected for the ensuing year by the Indiana Electric Light Association were: President, Norman A. Perry, president Indianapolis Power & Light Company; vice-president, C. V. Sorenson.

Great Lakes Engineers Meet in Chicago

With a total attendance of 160 at the committee meetings, the Engineering Section, Great Lakes Division, N.E.L.A., met in Chicago on May 10-12. The committees that appeared to hold most interest, judging from the numbers trying to crowd into the rooms, were the electrical apparatus, underground, overhead lines and meter, although the inductive co-ordination, hydraulic power and accident prevention meetings were well attended also. The apparatus committee received two excellent reports on the current-carrying capacity of copper busbars and bus stresses under short-circuit conditions. These reports were compiled from tests made by the Commonwealth Power Corporation. A detailed report on the operation of high-voltage transmission lines, including tabulations of outages and their causes on 57 lines of above 100 kv., was presented to the overhead systems committee. The next revision of the National Electrical Safety Code was discussed in this committee, and action was taken to arouse interest in this subject among member companies so that present onerous requirements of the code may be corrected. At the general meeting, which was presided over by F. E. Andrews, chairman of the section, W. L. Abbott, chief operating engineer of the Commonwealth Edison Company, made an address on "After the Coal is Gone—What Then?"

Maryland Fight Ends

Consolidated Gas, Electric Light & Power Company Buys Northern Maryland Power from Philadelphia Electric, Subject to Commission Approval—Price Said to Be $500,000

CONTROL of the Northern Maryland Power Company, operating in Havre de Grace and neighboring territory, has, assuming the consent of the Maryland Public Service Commission, passed at last to the Consolidated Gas, Electric Light & Power Company of Baltimore, whose contest with the Philadelphia Electric Company over this property has for more than a year been keen. (See ELECTRICAL WORLD for April 14, page 779.) H. A. Wagner, president of the Baltimore company, issued a statement on May 16 saying:

"The directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, at a meeting of the board held today, ratified an agreement between their company and the Northern Maryland Power Company providing for the acquisition by the Consolidated company of the property and business of the Northern Maryland Power Company in the whole of Harford County, excepting the Fifth election district, which is contiguous to the Conowingo power development."

It was understood that the Baltimore company paid more than $500,000 for the property, which was acquired by the Philadelphia Electric during the fight. The contest is believed to have assumed the proportions it did, not because of the unimportant territory directly involved, but in anticipation of the electrification of the Pennsylvania Railroad and because of strategical motives with respect to future industrial development.

Purchases and Mortgages

The United Gas Improvement Company has disposed of its controlling interest in the Burlington Light & Power Company of Burlington, Vt., to the People's Light & Power Corporation. The sale is in accord with the company's policy to dispose of isolated properties and to group its holdings in public utilities so as to permit of the most economical operation.

The Pennsylvania Edison Company of Easton, Pa., has been merged into the Metropolitan Edison Company of Reading. Both are General Gas & Electric Company properties.

A petition for the incorporation of a second group of small light properties in the proposed Southeastern Indiana Power Company has been filed with the Indiana Public Service Commission by C. T. DeHore, president of the DeHore Management Corporation. These are the Milroy Light & Power Company, which serves Blue Ridge, Moscow, Clarksburg, Andersonville and Richland; the Atwood-Burkit Light & Power Company and the Battleground Light & Power Company. (See ELECTRICAL WORLD for May 19, page 1033.)

A petition has been filed with the Indiana Public Service Commission by the Greendale Water & Electric Company for leave to purchase the utility holdings in Greendale, Ind., of the A. D. Cook Company of Lawrenceburg, Ind., for $75,000.

Shelbyville, Ill., has turned a deaf ear to tentative offers to buy its municipal electric light plant understood to have been made by the Central Illinois Public Service Company and will rehabilitate its plant at a cost of approximately $100,000.

Purchase of the South Sioux City (Neb.) municipal electric light plant by the Sioux City Gas & Electric Company and the grant of a 25-year franchise will be submitted soon to a vote. The company, which has made an offer of $75,000 for the plant, will pay costs of the special election.

Application has been made to the New York Public Service Commission by John D. Holmes for consent to transfer his electric plant in Downsville, Delaware County, to the New York State Electric Corporation.

The Atlantic City Electric Company has taken over the operation of the electric plant of Greenwich Township, Gloucester County, N. J. The company paid the township $31,870 for the property.

The Staunton (Va.) City Council is considering sale of the city's electric plant to the Virginia Public Service Company, which also has a plant in Staunton. A series of alternative proposals have been submitted to the company.

An offer from the Virginia Electric & Power Company of $35,000 for the lines and franchise of the Tarboro (N. C.) electric plant has been refused by the city commissioners.

By an overwhelming majority, the voters of Milton, Fla., on May 15 approved the sale of the municipal electric plant to the Gulf Power Company for $65,000, granting the company also a 20-year operating franchise.

The Southwestern Light & Power Company has purchased the privately owned light and power plant and distribution system in Davidson, Okla.

The Oklahoma Gas & Electric Company has purchased the 13,000-kw. Belle Island generating station of the Oklahoma Railway Company in Oklahoma City. This transaction follows the recent leasing of this station by the Oklahoma Gas & Electric together with transmission lines owned by Oklahoma Railway Company.

Operating in Crescent City, Calif., the Mountain Power Company has applied to the Railroad Commission for authority to sell its properties to the Public Utilities California Corporation for $85,000.

The Smith River Power Company, operating in Del Norte County in northern California, has applied to the California commission for authority to sell, and the Public Utilities California Corporation for authority to purchase, the properties of the former for $23,200 in capital stock.

Montefiore Foundation Essay Award for 1929

Announcement is made by the association of electrical engineers composed of alumni of the Institut Electrotechnique Montefiore, Liége, Belgium, that the triennial prize awarded by the Fondation George Montefiore for the best original treatise (not of a popular character or a mere compilation) upon the scientific advance of electricity and its technical application in all domains will be again bestowed next year. This prize represents the accumulated interest on 150,000 francs invested in Belgian funds at 3 per cent and will amount to 29,000 francs.

Essays submitted must have been written in the three years preceding the award. They may be either in French or English, signed or anonymous, and must be printed or typewritten, twelve copies to be furnished. Five Belgian and five foreign electrical engineers, under the presidency of the director of the Montefiore institute, form the jury. The last day for the reception of papers submitted will be April 30, 1929. Further details of the competition will be supplied by the secretary-general of the Association des Ingénieurs Electriciens sortis de Institut Electrotechnique Montefiore—L. Calmeau, 31 rue Saint-Gilles, Liége, Belgium.

Summer School for Engineering Teachers to Be Repeated

The Summer School for Engineering Teachers, open to all such teachers in the United States and Canada, which was established by the Society for the Promotion of Engineering Education in 1927, is to continue its sessions during the coming summer. Two schools will be held—one for teachers of physics and the other for teachers of electrical engineering. As in 1927, when mechanics was the subject studied, the purpose will be to study the principles and methods of teaching rather than to review actual content of subject matter.

The session on teaching physics will be at the Massachusetts Institute of Technology under the directorship of Dr. S. W. Stratton, president. The session on electrical engineering will be at Pittsburgh under the joint auspices of the University of Pittsburgh and the Westinghouse Electric & Manufacturing Company. Dr. F. L. Bishop of the University of Pittsburgh, secretary of the S.P.E.E., and Prof. Charles F. Scott of Yale University, chairman of the society's board of investigation and coordination, will serve as co-directors of the Pittsburgh session of the school. Prof. H. P. Hammond, associate director of the society's investigation of engineering education, is in general charge of the schools. Both sessions will be of three weeks' duration and will begin soon after July 4.

Applications Before Federal Power Commission

The Niagara Falls Power Company has applied to the Federal Power Commission for the right to use all treaty water at Niagara Falls. At present that company is using 19,725 sec.ft. of the 20,000 sec.ft. available. The remaining 275 sec.ft. is being used by various licensees on Eighteen-Mile Creek, between Lockport and Lake Ontario, where it is transported through the State Barge Canal. These licensees have announced their willingness to surrender their licenses. The water can be used to develop virtually twice the amount of power at the Falls that it is now producing.

As reported last week, L. E. Bryant of Roberta, Tenn., has applied to the commission for a preliminary permit covering a project on the Rock Castle and Laurel Rivers near the boundary of Kentucky and Tennessee. It is planned to build a dam 190 ft. high on the Rock Castle River one mile above its mouth, where 20,000,000,000 cu.ft. of water would be stored. The dam on the Laurel River is to be 150 ft. high and would store 7,000,000,000 cu.ft. The power houses are to be below each dam and will be interconnected. Under such a plan it is estimated that 28,600 hp. of primary power can be made available. It is the intention of the applicant to install 39,300 hp. The power is to be used at coal mines in the vicinity of the sites.

The Kassan Gold Company of Seattle has applied for a preliminary permit covering a development on the east side of Prince of Wales Island, Alaska. It is proposed to construct a dam at the outlet of Little Salmon Lake so as to provide 10,000 acre-feet of storage. It is planned to install 1,500 hp. and to build a transmission line 10 miles long to the applicant's mine.

The Red River Lumber Company of Minneapolis has filed two applications for preliminary permits covering developments on Horse Creek at a point near Pittville, Calif., and on Lost Creek near Cassel, Calif. At the former project it is planned to make available 1,200 hp. of primary power and at the latter 4,800 hp. of primary power.

The Interstate Public Service Company of Indiana has withdrawn its application for a license covering a 6,000-hp. project on the East Fork of the White River. The company took this action on the ground that the project was not economically feasible under present conditions.

Fred and John Dover, who have been operating a project at U. S. Dam No. 6 on the Muskingum River, Ohio, have applied for a license under the water-power act. The War Department lease under which they have been operating has recently expired.

The Truckee River Power Company has applied for a license covering the erection of 28 miles of transmission line to connect an existing line with Durkee, Idaho, and to connect Tahoe City to Brockway.

Briefer News

WATERBURY STEAM STATION ABANDONED.—The Connecticut Light & Power Company, Waterbury, Conn., has abandoned its Waterbury power station, erected twenty years ago, and will get its power for that city entirely from its hydro-electric plants.

NEW UNIT GOES IN FOR GULF STATES UTILITIES TEXAS SYSTEM.—A 35,000-kw. turbo-generator was placed in operation last week at the Neches power station of the Gulf States Utilities Company of Beaumont, Tex., which serves a territory extending for more than 250 miles along the Gulf Coast. Transmission lines are nearly completed connecting 23 communities north of Houston to this base-load plant, which has been more than doubled in size.

FIGHT OVER ABSORPTION OF MARYLAND UTILITIES RESUMED IN COURT.—The Electric Public Utilities Company has renewed its suit for the vacation of the Maryland Public Service Commission's order refusing to grant it authority to purchase the stock of the Home Electric Company of Lonaconing, the Emmitsburg Electric Company, the Antietam Electric Light & Power Company and the Midland Electric Light Company, all Maryland corporations. The commission's action was recorded in the ELECTRICAL WORLD for May 5 (page 927.)

CINCINNATI RATE BILL PASSES COUNCIL.—Cincinnati's City Council has passed the new electric rate bill (ELECTRICAL WORLD, April 21, page 826), and it will go into effect on Sept. 1. It is designed to cut off from $500,000 to $600,000 of the Union Gas & Electric Company's net annual profit from electricity on the basis of present consumption. One councilman opposed the measure, asserting that the city should continue its fight in the federal courts to make effective the first new ordinance proposed, which was designed to cut off $750,000 net profit.

OREGON COMMISSION LACKS FUNDS FOR RATE INVESTIGATION.—Estimates thought conservative place the number of electrical engineers necessary for a state investigation of the valuations of the widely ramified properties of the Portland Electric Power Company and the Northwestern Electric Company at a minimum of fourteen, and the expense of such a probe would possibly reach an almost prohibitive sum. At the present time the Oregon Public Service Commission has for its engineering personnel one chief and one assistant, and the funds with which to operate the department until the Legislature again meets next January are about exhausted. The commission on its own motion has ordered that the valuations of the two Portland utilities be undertaken at once, but whether it will be able to carry out this program is said to be doubtful.

PORTLAND COUNCIL ENGAGES TACOMA ENGINEER TO VALUE PROPERTY OF PORTLAND ELECTRIC POWER COMPANY.—Kenneth G. Harlan, Tacoma (Wash.), utility engineer, has been retained by City Council of Portland, Ore., to evaluate the property of the Portland Electric Power Company with a view to obtaining revision of electric rates. Mr. Harlan will be paid a flat rate of $48,000, hiring his own assistants. The work must be finished by Dec. 15. The council will present the data gathered in a petition to the Public Service Commission for new rates.

RESTRICTIONS ON KLAMATH RIVER MAY BE RECONSIDERED BY VOTERS.—To determine whether the Klamath River can be used both for the maintenance of industrial plants and as a recreational and angling stream, a study is to be started in the near future under the leadership of the California Development Association. If the finding is that the dual use is feasible, it is probable that the voters will be called on by initiative to reconsider the vote by which in 1924 the river was declared closed to industrial and power development.

MORE INTERCONNECTION IN VIRGINIA.—Transmission lines of the Virginia Electric & Power Company will soon be extended 13 miles from Quantico to Occoquan, Va., connecting that point with the lines of the Virginia Public Service Company running south from Alexandria. The cost of the new extension is put at approximately $150,000. The line, to be completed probably by September, will carry 66,000 volts. Connections with the Virginia Public Service Company at Roanoke Rapids, N. C., will be made also.

TONAWANDA POWER COMPANY TO HAVE NEW OFFICE BUILDING.—Officers and directors of the Buffalo, Niagara & Eastern Power Corporation and the Tonawanda Power Company assembled at North Tonawanda, N. Y., on May 17 to take part in the ceremonies attending the laying of the cornerstone for an ornamental quarter-million-dollar two-story building to be occupied jointly by the Tonawanda Power Company and the State Trust Company. According to the designers, the lighting effects, exterior and interior, to be used for the new building will be "the best between New York City and Chicago."

HUGHES ELECTRIC WILL BUILD 225 MILES OF LINE IN NORTH DAKOTA.—Announcement that the Hughes Electric Company of Bismarck, N. D., will build 225 miles of transmission line during the summer of 1928, has been made by O. W. Mattison, new general manager of the company. Included will be a line from Beulah to Bismarck, a line connecting Elgin and Thunderhawk and a line from Sterling to Bismarck. The transmission expansion is in addition to plant improvements at Beulah increasing the plant capacity substantially. New-type boilers are being installed.

ARTISTIC LIGHTING EQUIPMENT CONVENTION.—In connection with an elaborate exhibition of lighting equipment to be held at the Sherman Hotel, Chicago, on June 11-16, by the Artistic Lighting Equipment Association, there will be a convention of that society, at which group meetings of manufacturers, distributors and dealers will be supplemented by open sessions. At one of these there will be a discussion on "meeting the problem of lower selling costs." At the first day's proceedings William R. Dawes, president of the Chicago Association of Commerce, will make an address.

SHAWINIGAN COMPANY CONTEMPLATES ADDING TO ITS RESOURCES.—It is likely that the Shawinigan Water & Power Company will soon increase its power resources in the Province of Quebec by the acquisition of sites having a total potential capacity of 500,000 hp. These sites are on the St. Maurice River above La Tuque. They are to

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]

National Electric Light Association—Atlantic City, June 4-8. P. S. Clapp, 420 Lexington Ave., New York.

American Association of Engineers—Hotel Hussman, El Paso, Tex., June 4-6. M. E. McIver, 63 E. Adams St., Chicago.

National Electrical Manufacturers' Association—Radio Division, Chicago, June 4-7.

Electrical Supply Jobbers' Association—The Homestead, Hot Springs, Va., June 5-8. E. Donald Tolles, 165 Broadway, New York.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., June 11-15. S. N. Clarkson, 420 Lexington Ave., New York.

Artistic Lighting Equipment Association—Hotel Sherman, Chicago, June 11-16. G. P. Rogers, 420 Lexington Ave., New York.

Pacific Coast Division, N.E.L.A.—Hotel Huntington, Pasadena, Cal., June 12-15. S. H. Taylor, 447 Sutter St., San Francisco.

Georgia Electrical Association—Savannah, June 14 and 15. J. J. McDonough, Georgia Power Co., Dublin, Ga.

Northwest Division, N.E.L.A.—Portland, Ore., June 19-22. B. Snow, 1208 Spalding Bldg., Portland, Ore.

Canadian Electrical Association—SS. "Richelieu" from Montreal to Saguenay and return, June 20-23. H. M. Lyster, 712 Power Bldg., Montreal.

American Institute of Electrical Engineers—Cosmopolitan Hotel, Denver, June 25-29. F. L. Hutchinson, 33 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Hotel Stevens, Chicago, June 25-28. J. F. Kelly, Empire Bldg., Pittsburgh.

American Society for Testing Materials—Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. C. L. Warwick, 1315 Spruce Street, Philadelphia.

East Central Division, N.E.L.A.—Cedar Point, Ohio, July 10-13. D. L. Gaskill, Greenville, Ohio.

Wisconsin Utilities Association, Electric Section—Appleton, Wis., July 26 and 27. J. N. Cadby, 432 Broadway, Milwaukee.

be auctioned by the Quebec government on May 23, and it is conceded that Shawinigan will in all probability be the only bidder. It is altogether likely that the company will use these sites to serve the St. Maurice Valley territory or the more easterly sections of the Shawinigan system, rather than Montreal, which is about 250 miles from the additional source of power.

DUQUESNE LIGHT COMPANY PLACES HIGHLAND SUBSTATION IN OPERATION.—Another substation has just been added to the chain of eight which serve Pittsburgh by stepping down 66,000-volt power from the Colfax generating station to 22,000 volts and then transmitting it to distribution stations. The new substation, known as the Highland, is rated at 30,000 kw. and is about nine miles from Colfax. At present only one circuit to it has been built, though it is designed for two. The connection necessitated an overhead crossing of the Allegheny River and the construction during the winter months of a steel-tower transmission line over rough, hilly country.

WORK STARTS ON NEW GORGAS UNIT FOR ALABAMA POWER COMPANY.—Construction work has started on the new Gorgas steam plant (Unit No. 4) of the Alabama Power Company, an announcement by the company says. Excavation will be completed in the early autumn. Steel erection is scheduled to begin about the middle of June and will be completed about the first of August. Condensers will be installed in October, the boilers in September and the turbines in December. The present schedule calls for completion of the plant about May 1, 1929. The plant will ultimately add 240,000 kw. to the Alabama Power Company's system in four units of 60,000 kw. each, of which the one under way will be the first.

SPRINGFIELD, MASS., GOING AHEAD WITH CITY-OWNED HYDRO PLANT.—Construction of the large dam and tunnel for the water system expansion and electric power development by the city of Springfield, Mass., in connection with its Little River supply will be started early this summer, according to present plans. A call for bids probably will be issued early in June. The water commissioners have authorized the city solicitor to make a contract with the Turners Falls Power & Electric Company for a lease of the power plant, at a rental price of $270,000 a year for 30 years (see ELECTRICAL WORLD for Dec. 10, 1927, page 1216). A bond issue of $4,500,000 has been authorized by the city for the development.

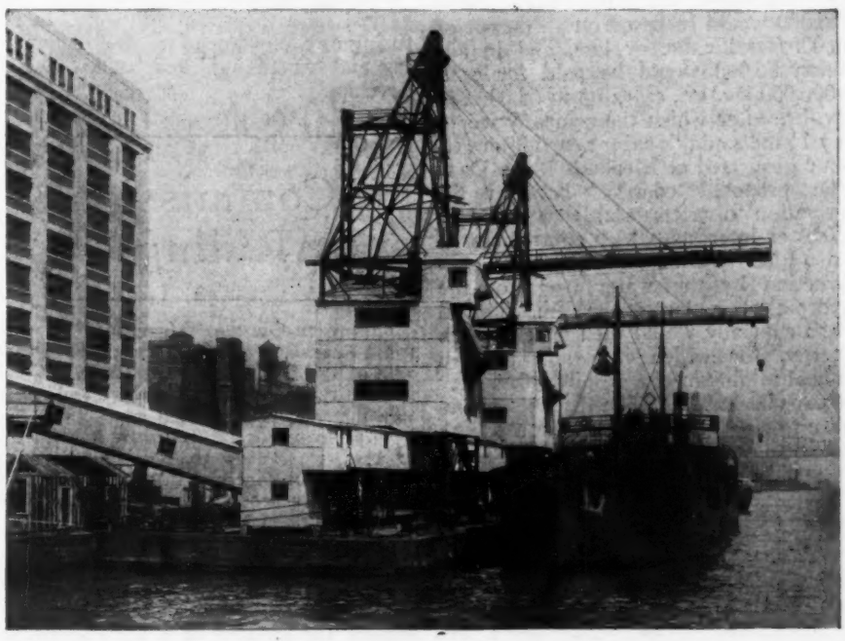
RATE REDUCTIONS IN MISSOURI AND ARKANSAS.—Reductions in electric rates for residence consumers in 92 Missouri towns are provided in rate schedules filed with the Public Service Commission at Jefferson City, Mo., May 11 by the Missouri Public Service Company and the Arkansas-Missouri Power Company. Both have their headquarters in St. Louis and are controlled by the Insull interests. Power for industrial and commercial use is reduced in 30 of the towns under the new schedules. Similar reductions will be made in 27 towns in Arkansas served by the Arkansas-Missouri Power Company. The reductions in Missouri range from 5 to 25 per cent and approximate $100,000 annually. Prior to May 11 the Missouri Power & Light Company reduced rates affecting 94 towns and aggregating $127,000 and the Maryville Electric Light & Power Company cut its rates in Maryville.

RIGHT OF OWNER OF APARTMENT HOUSE TO RETAIL ENERGY TO BE TESTED IN BROOKLYN.—Whether a landlord can compel the Brooklyn Edison Company to furnish energy wholesale to an apartment house so that electricity may be retailed to tenants instead of permitting them to deal with the electric company directly will be determined in a suit filed last week in the New York Supreme Court. The owner asserts that under rulings of the Public Service Commision a landlord has a right to buy energy at wholesale and retail it. He alleges that the electrical equipment in his apartment building is valued at $30,000 and that representatives of the Brooklyn Edison Company have notified him that they intend to deal with the tenants directly or else remove the meters from the building and suspend service for all purposes.

INDIANAPOLIS COMPANY COMPLETES NEW ADMINISTRATION PLANT.—Centralization of the service operations of the Indianapolis Power & Light Company is made possible with the completion of a new million-dollar plant on Morris Street, covering a fourteen-acre tract. Officials of the operating and engineering departments have just moved into the three buildings composing it, which have been in course of construction for about two years. These are an administration building, with a storage building and a garage on either side. All are of brick and concrete. They house five hundred men and women. The administration building is one of the most complete of its kind. On the lower floor is a large lecture room with club facilities for employees.

REMODELING OF CAHOKIA STATION INCLUDES NEW 75,000-KW. TURBINE.—The Union Electric Light & Power Company of St. Louis has made plans to

New York Edison Adopts New Coal-Hoisting System



A NEW coal-hoisting system that unloads coal directly from oceangoing vessels into the power generating station of the New York Edison Company on the East River at Thirty-eighth to Fortieth Street has been put into operation with the unloading of the Pocahontas Steamship Company's collier *Bristol* from Norfolk. The effect of the new system, an official of the New York Edison Company said, is to broaden the company's coal market, so that now coal may be obtained either by oceangoing colliers or by rail. Moreover, by the new system coal can be unloaded from moored colliers into barges for transport to the other power-generating plants owned by the company.

In the new system the bucket hoist is only 60 ft. The clamshell buckets place the coal on belt conveyors, one of which is 395 ft. long, for the remaining elevation of 100 or more feet to the bunkers. These long conveyors reach out to 30-ft. deep water, where oceangoing vessels can be moored. Two steel towers for hoisting the grab buckets travel on rails, permitting the buckets to be dropped into the various hatches without moving the vessel. The two buckets have a capacity of 350 tons an hour each. The *Bristol*, the first collier to be unloaded by the new system, carried 6,600 tons.

remodel and expand its Cahokia station, on the Illinois side of the Mississippi. The plans include the installation of a 75,000-kw. General Electric turbo-generator. Space for it will be provided by removing a 30,000-kw. machine. Foundations will be strengthened to suit the larger unit and the condenser altered. The unit which is removed will be installed in the Venice station of the company, adjacent to Cahokia. The new turbine will be a single-cylinder, 1,800-r.p.m. machine receiving steam at 315 lb. gage, 300 deg. superheat, and will operate against a back pressure of 1 in. absolute. The generator will be rated at 60 cycles, 13,800 volts, three-phase, and 90 per cent power factor.

NEW OFFER FOR PURCHASE OF ELEPHANT BUTTE POWER.—The Texas-Louisiana Power Company has submitted a proposal to the boards of directors of the irrigated districts of the upper Rio Grande Valley for the development and utilization of electric power from the Elephant Butte reclamation dam in New Mexico. There is already pending before the boards of directors a similar proposal from the El Paso Electric Company. The proposal of the Texas-Louisiana company is to construct and operate a hydro-electric plant at the dam and pay to the water users a minimum of $86,000 yearly with no investment on their part. The $86,000 would be based on an output of 40,000,000 kw.-hr. or less, and in addition $6,000 would be paid for each 5,000,000 kw.-hr., extra up to 68,000,000 kw.-hr., after which the company would pay 1¼ mills additional for each kilowatt-hour generated at Elephant Butte Dam. The proposed contract between the irrigation districts and the Stone & Webster interests, which control the El Paso Electric Company, is based on construction by the water users of the hydro-electric plant at the dam. The El Paso company would then purchase the energy, for which it would pay an annual minimum charge of $180,000 for 36,000,000 kw.-hr. The districts would have to issue bonds to raise money with which to build the plant.

WATER-POWER SITE FILINGS IN OREGON.—Albert Anderson of Grant's Pass, Ore., has filed an application with the State Engineer for a permit to construct a reservoir for the storage of 18,700 acre-feet of water from the South Fork of the Coquille River and to appropriate 75 sec.-ft. of such stored water and the natural flow of the river for the development of 13,261 theoretical horsepower. The site is in Coos County, the operating field of the Mountain States Power Company, which maintains priority rights. An application was filed also by W. E. Green, Portland, for a permit to appropriate 2,500 sec.-ft., from the Deschutes River in Sherman County for the development of 420,000 theoretical horsepower. This site is in territory now served by the Deschutes Light & Power and the Pacific Light & Power Companies. E. G. Hopson of Portland has filed application for a permit to appropriate 5,000 sec.-ft. of water from the Deschutes River for the development of power in Sherman County. A. L. Shreve of Mapleton has filed on waters in Berkshire Creek for light and power development purposes in Lane County, and D. P. Slater of Dallas asks permission to appropriate water from Rock Creek for power supply in Lincoln County.

TENNESSEE COMMISSION VALUATION CONTESTED.—Valuation by the State Railroad and Public Utilities Commission of Tennessee of the Tennessee Eastern Electric Company at $2,500,000 and of its subsidiary the Johnson City Traction Corporation at $225,000 is being contested in the Circuit Court at Nashville by the utilities, which claim a joint value of $6,695,000. A special commissioner appointed by the court has placed the value at $3,500,000. He rates the physical value of the hydro-electric developments and the steam plant of the petitioners at $2,925,000. The companies claimed a "water-power value" of $2,000,000, which the commission refused to recognize at anything, but which Commissioner Kirkpatrick set at $200,000. The companies claimed a "going value" of $750,000 which the commission set at $240,000 and the Kirkpatrick report raised to $275,000. Commissioner Kirkpatrick allowed a "working capital" of $100,000, but agreed with the state authorities in refusing any allowance for "cost of financing and organizing" and "added risk in developing."

Commission Rulings

CUSTOMER-OWNED METERS EXCLUDED FROM RATE-FIXING VALUATION.—A former rule of the Colorado Public Utilities Commission requiring utilities to own and maintain meters and incidental connections has been permanently suspended by it, with the express restriction that such equipment owned by consumers shall not be valued as useful utility property in any valuation for rate-making purposes.

CONSUMER HAS NO RIGHT TO HAMPER REGULAR READING OF METER.—Although holding that discontinuance of service to enforce the payment of a bill disputed in good faith is not justified until the question of indebtedness has been settled in a court of law, the New Jersey Board of Public Utility Commissioners blamed a customer of the Public Service Electric & Gas Company for rendering it difficult for the company to make regular monthly meter readings, saying: "This case differs from the usual complaints received by the board in that the meter, through the fault of the complainant, was not read monthly. If the readings had been made monthly, the trouble might have been averted. The testimony shows that the complainant's house was frequently closed when the meter reader called and that regular readings were impossible; also it appears that the complainant is the owner of several police dogs, which he keeps on the premises, and warned the meter reader to beware of them. The company is fairly entitled to have the meter at complainant's premises read monthly by its meter reader. It cannot be reasonably expected to make a special or unusual effort to obtain readings. If the complainant refuses or neglects to maintain a condition at his residence admitting of regular meter readings without hazard or threat of same to the reader, the company will be justified in discontinuing service and refusing to resume the supply until such condition is corrected."

Recent Court Decisions

COMPANY RESPONSIBLE FOR INJURY TO BOY WHO CLIMBED FATHER'S TREE, THROUGH WHICH COMPANY'S WIRE RAN.—Damages were affirmed in Anstead vs. Pacific Gas & Electric Company by the Supreme Court of California. This suit was brought because of injury to a nine-year-old boy who climbed a tree on his father's ranch to pick apples and came in contact with a high-tension wire belonging to the company and passing through the tree. The allegation that it was the custom for power companies to run their wires through fruit and shade trees did not excuse the defendant, the court said, unless this practice was shown to be consistent with due care. The accident itself showed that the insulation was not sufficient. The boy had a right to be in the tree. Errors in the admission of evidence had not prejudiced the case, the court held also, and the verdict for $15,000 for permanent injury was not excessive as a matter of law. (265 Pac. 487.)*

SUPREME COURT FINDS SPECIAL TAX FOR RECORDING LONG-TERM MORTGAGES UNCONSTITUTIONAL.—A tax of 20 cents upon each hundred dollars of mortgage indebtedness recorded in Kentucky where the indebtedness does not mature within five years has been declared unconstitutional by the United States Supreme Court in Louisville Gas & Electric Company vs. Coleman, State Auditor, and it has reversed the action of the lower court in sustaining the law. "It seems clear," the Supreme Court says, "that a circumstance which affects only taxable values has been made the base of a classification under which one is compelled to pay a tax for the enjoyment of a necessary privilege which—aside from the amount of the recording fee which is paid by each—is furnished to another as a pure gratuity. Such a classification is arbitrary. . . . The effect is to deny plaintiff the equal protection of the law in violation of the equality provision of the Fourteenth Amendment." In a dissenting opinion by Justice Brandeis, concurred in by Justices Holmes and Stone, it was said: "There is abundant proof that the Legislature was justified in thinking that the bulk of the long-term loans would escape the general property tax, while most of those for a short term would not. . . . The equality clause would not prevent a state from confining the recording tax to deeds of trust given to secure bonds of a public service corporation. . . . If the statute as applied does not in fact discriminate in favor of any property of a like nature, there is not inequality in treatment."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

Dwight Heads Boston Section A.I.E.E.

Prof. H. B. Dwight of the Massachusetts Institute of Technology was elected chairman of the Boston section of the American Institute of Electrical Engineers at the annual meeting last week, the new vice-chairman being Wellen H. Colburn of the Edison Electric Illuminating Company of Boston and the secretary and treasurer George J. Crowdes of the Simplex Wire & Cable Company, Boston.

ELMER A. SPERRY, chairman of the board of directors of the Sperry Gyroscope Company, Brooklyn, N. Y., was nominated for the presidency of the American Society of Mechanical Engineers at a recent meeting of the nominating committee held at Pittsburgh, Pa., during the spring meeting.

NICHOLAS M. DU CHEMIN has been placed in charge of the West Lynn works of the General Electric Company during the illness of Frank P. Cox, manager. Mr. Du Chemin has been in the employ of the company for nearly fifteen years, having passed through the company's apprentice course at the River Works, Lynn, Mass., and risen to the post of general superintendent at West Lynn. The many friends of Mr. Cox in the electrical industry will be glad to learn that he is on the road to full recovery.

M. V. WATSON, manager of the Arizona Power Company, Prescott, Ariz., for seventeen years, has been appointed general manager of the Peoples West Coast Hydro-Electric Corporation, Portland, Ore. Mr. Watson's early experience was obtained in the employ of electrical contractors of Kansas City, Mo., and the U. S. Reduction & Refining Company's plant in Colorado Springs. Subsequently he served as superintendent of the Guanajuato Power Company's plant in Zamorra, Mexico, and in the engineering department of the Central Colorado Power Company, Denver.

JOHN W. LIEB, vice-president of the New York Edison Company, sailed for Europe, May 19, aboard the liner *Hamburg*. His first objective will be England, where he is planning to obtain a much-needed rest. While in London Mr. Lieb, as an official delegate of the American Institute of Electrical Engineers, will attend the centenary of the Institution of Civil Engineers (British). Later he will attend the inauguration of the Library, University of Louvain, as an official delegate of the American Engineering Societies, during which there will be presented the clock and carillon, the gift of the Engineering Foundation. Before returning to New York Mr. Lieb will visit Paris and as vice-president and representative of the National Electric Light Association attend the meeting of the International Union of Producers and Distributors of Electrical Energy. Mr. Lieb will arrive in New York late in July.

R. T. Smalley President of Middle West Division

R. T. Smalley, who was elected president of the Middle West Division of the National Electric Light Association at its recent convention in St. Louis, Mo., as announced in the May 19 issue of the ELECTRICAL WORLD, is vice-president of the Kansas Electric Power Company with headquarters at Lawrence, Kan. Mr. Smalley is a graduate of the College of Emporia and entered the employ of the Kansas Electric Power Company in 1919 as meter reader and repair man.

R. T. Smalley

He later became assistant manager of the Emporia district and in 1921 was transferred to the Parsons, Kan., district of the same company. In 1923 he returned to Emporia as district manager and in 1926 was transferred to the general offices of the company at Lawrence as assistant general manager. Early this year Mr. Smalley was elected a vice-president of the Kansas Electric Power Company. He has been an active figure in association work in Kansas, directing his attention especially to the Kansas Public Service Association, the Kansas Section and the Middle West Division of the National Electric Light Association and the Information Bureau of Kansas Public Service Companies.

RAY BAUMGARDNER of Dallas has been appointed director of public information for the Central & Southwest Utilities Company to succeed the late George McQuaid. Mr. Baumgardner has been state manager of the Associated Press for the past seven years. In his new position he will be responsible for the direction of information services of several operating companies in Texas, Oklahoma and Arkansas, including the Southwestern Gas & Electric Company, the Central Power & Light Company and the West Texas Utilities Company.

H. EDMUND MACHOLD, president of the Northeastern Power Corporation, has been elected president of the Northern New York Securities Corporation, Watertown, N. Y.

Obituary

JAMES W. BULLOCK, until several years ago an officer of the Bullock Electric Manufacturing Company, Cincinnati, died May 9 at his home in that city following two weeks' illness of pneumonia. Though an officer and director of a number of Cincinnati corporations at the time of his death, Mr. Bullock retired from active business about two years ago.

ROY B. MCPHERSON, general superintendent of the electrical department of the Utica (N. Y.) Gas & Electric Company, died at his home in that city May 14 after a short illness. Mr. McPherson was born in New York Mills, N. Y., in 1894. In 1915 he became associated with the Utica Gas & Electric Company, eight years later being made acting assistant superintendent. In 1924 he was named general superintendent.

CHARLES W. MULLEN, at one time a member of the Public Utilities Commission of Maine, died at his home in Bangor, May 18. Following graduation from the University of Maine in 1883, he entered upon a career that embraced railroad building, the development of hydro-electric power and the construction of pulp and paper mills in New England and Canada. Mr. Mullen was also prominent politically, having been Mayor of Bangor in 1911 and 1912 and a former state senator.

DALE PETERS, manager for the Southern California Edison Company at Huntington Beach, Cal., died May 7 from the effects of an apoplectic stroke, sustained while playing golf. Mr. Peters had been manager at Huntington Beach for more than four years.

DONALD KEMP PROSSOR, an electrical engineer attached to the Pittsfield (Mass.) Works of the General Electric Company, was accidentally killed recently at Durham, N. C., by an electric shock received on a construction job for the Carolina Power & Light Company. He was 29 years of age, a graduate of New York University in 1921 and was favorably known through his connection with the 132-kv. cable installation lately made in New York City.

Financial and Statistical News

Market Prices Recover Several Ten-Point Losses

POWER and light stocks participated very actively in the sharp market decline which brought averages down several points this week from previous high levels. Although losses were not as heavy among utility stocks as in some other groups, ten-point losses during the decline were not at all exceptional, while fifteen and twenty-point declines took place in isolated cases. With the combination of high money rates and the reaction from an unusually buoyant market the previous week, the stage was in every way set for a successful bear movement and the one which took place was the most important selling movement for some months.

Among the stocks which reacted sharply from recent high prices were American Gas & Electric, Southeastern Power & Light, Public Service of New Jersey, Philadelphia Electric, Pacific Gas & Electric, Brooklyn Edison, Middle West Utilities. Utility stocks, however, were among the first to recover after the selling movement.

Two New German Loans Floated

Twenty-year 6 per cent gold sinking fund debentures of the Allgemeine Elektricitäts Gesellschaft (General Electric Company, Germany) have just been offered to the amount of $10,000,000, the price being 94½ and interest to yield 6.50 per cent. These debentures were dated May 1, 1928, and mature May 1, 1948.

A five-million-dollar offering was made by the Unterelbe Power & Light Company (Elektricitätswerk Unterelbe, Aktiengesellschaft) in the form of 25-year 6 per cent sinking fund mortgage gold bonds, priced at 93 and interest to yield over 6.55 per cent.

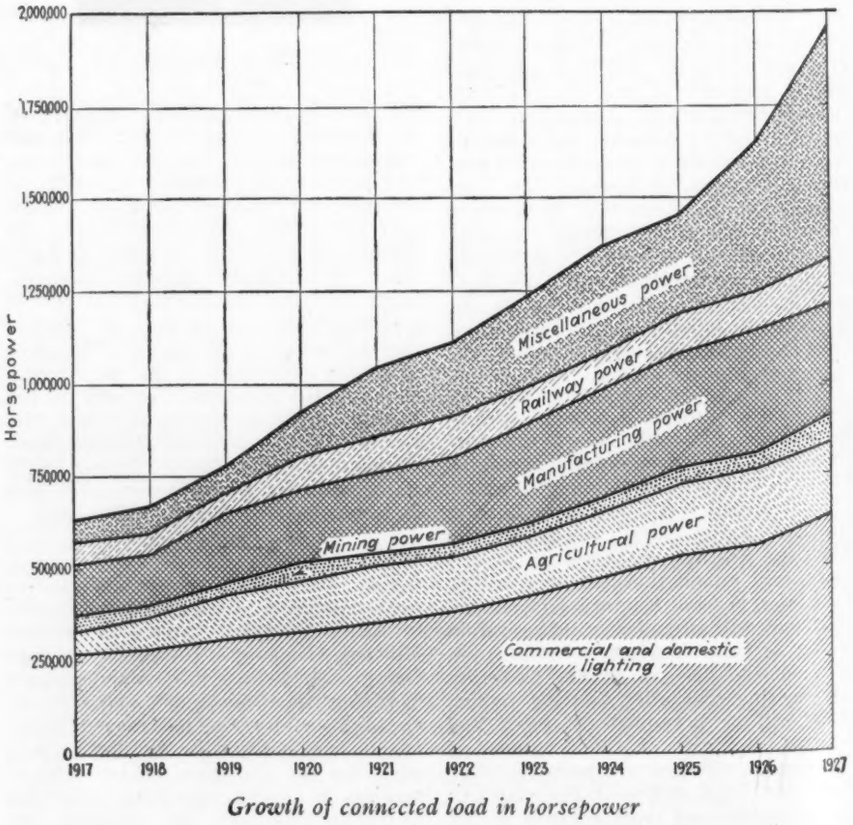
RECENT LISTINGS.—The New York Stock Exchange has authorized the listing of 532,000 additional shares of common stock of the Engineers Public Service Company on official notice of issuance in exchange for bankers' interim receipts for $5 dividend preferred stock, or in exchange for $5 dividend preferred stock when issued, making the total amount applied for 1,649,905 shares. The New York Exchange has also authorized the listing of 1,127,459 shares of common stock of the Pacific Lighting Corporation without par value and of $5,482,850 additional common stock (par $25) of the Southern California Edison Company, making the total amount applied for $56,807,050. The securities of foreign companies were also authorized for listing. Refunding gold bonds of the Norwegian Hydro-Electric Nitrogen Corporation were authorized for listing to the amount of $20,000,000 and first mortgage sinking fund bonds of the Shinyetsu Electric Power Company, Ltd. (Japan) were authorized for listing to the amount of $7,650,000.

NEW CINCINNATI GAS ELECTS DIRECTORATE.—Following the consummation of the merger of the Columbia Power Company, the Cincinnati Gas & Electric Company and the Union Gas & Electric Company into a new company called the Cincinnati Gas & Electric Company, Charles D. Jones, president of the old Cincinnati company, was elected chairman of the board of directors. The following directors have been elected: Samuel Assur, H. C. Blackwell, Alfred C. Cassatt, Fred W. Crawford, W. W. Freeman, Philip G. Gossler, James M. Hutton, Charles D. Jones, Polk Lafoon, Lawrence K. Langdon, John C. Pew, Edward Reynolds, Jr., Charles P. Taft and Frank M. Tait.

Pacific Gas & Electric Earns $2.66 on Common

CONCENTRATED into the prosperous and rapidly developing upper half of the state of California, Pacific Gas & Electric System has shown a steady annual growth in earnings to last year's $54,719,227 gross. The system has followed the policy of absorbing the properties of smaller companies until its plants and properties, with those of closely affiliated companies, today stand at the huge total of $300,434,894.

Last year's financial progress involves a 7.4 per cent rise in gross revenues and an 18.5 rise in net income. Operating costs and maintenance, taken jointly, were held practically unchanged over the previous year. The operating ratio was reduced from 57 in 1926 to 53 last year. Furthermore, the balance available for common stock was 30.4 per cent greater than in 1926, although dividends required by preferred stock were up about half a million. The balance after common stock was up almost 70 per cent. The company pays $2 on its $25 par common stock, or 8 per cent. Earnings last year on common amounted to $2.66, against $2.54 in 1926. At a current price of around $50 the stock is worth about nineteen times earnings, which is somewhat above the average. The system's property investment is about $5.45 per dollar of gross revenue. Bond interest was earned 2.8 times. Interest charges have been earned at least twice for the past fourteen years.



Growth of connected load in horsepower

TEN YEAR ANALYSIS OF GROWTH

	Actual Increase	Percentage Increase
Gross revenue	$34,905,846	176.17
Electric sales (kw.-hr.)	1,070,821,000	182.38
Gas sales (cu.ft.)	11,676,909,000	136.77
Consumers	517,060	37.927
Stockholders	37,927	465.88

Large investors today thoroughly examine the background of a company in which they propose to invest. Pacific Gas & Electric checks up very satisfactorily in this regard. A ten-year analysis shows the growth as given in the accompanying table.

HARTFORD UTILITY CHANGES SET-UP.—Stockholders of the Hartford Electric Light Company have approved a reduction in par value of the stock from $100 to $25 and an increase in shares from 180,000 to 720,000. The directors have been authorized to issue 80,000 shares of $25 par stock in substitution for the authority to issue 20,000 shares of $100 par value granted in February.

New Capital Issues

During the week ended May 24 the Allied Power & Light Corporation issued 150,000 shares of first preferred stock, $5 series, each share being accompanied by one share of common stock. Proceeds from the sale of this first preferred stock, together with the proceeds from the sale of preference stock and common stock, will be used in the acquisition of stock interests in and other assets of companies acquired and for general corporate purposes.

The American Gas & Power Company, which last week made an offering of gold debentures, issued 40,000 shares of first preferred stock, $6 series, at $96 a share and accrued dividends, to yield 6.25 per cent. Proceeds from the sale of this stock and the gold debentures referred to will be used to reimburse the company in part for the cost of its holdings.

Two additional offerings of the Texas-Louisiana Power Company were made during the week under review, one in the form of fifteen-year 6 per cent sinking fund gold debentures and the other in the form of 7 per cent cumulative preferred stock. The debentures totaled $1,700,000 and the stock $1,000,000. Proceeds are to reimburse for improvements and for general corporate purposes.

BUFFALO UTILITY ELECTS NEW DIRECTORS.—At the annual meeting of the Buffalo, Niagara & Eastern Power Corporation Lewis G. Harriman, Walter W. Huntley and Hans Schmidt were elected directors to fill vacancies.

NEW YORK POWER & LIGHT RECLASSIFIES STOCK.—At a meeting of the stockholders of the above company a resolution was adopted reclassifying the capital stock of the company to provide for the elimination of the 30,000 shares of 8 per cent preferred stock authorized and to increase the authorized $6 preferred stock by 30,000 shares. The outstanding 8 per cent preferred was called for redemption Jan. 1, 1928.

CONNECTICUT POWER SPLITS SHARES.—Stockholders of the Connecticut Power Company have ratified the change in common stock from 60,283

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 22	Low 1928	High 1928
ABITIBI PWR. & PAPER, com., new — no par	75¼	72	85
Ala. Pwr., $7 cum. pf.—no par	*k*115	114½	115½
Allis Chalmers Mfg.,6% com.	123	115¼	129¼
Aluminum Co. of Amer., com.	163	120	192½
Aluminum Co. of Amer., 6% pf.	109¼	105½	110
Amer & Foreign Pwr., 7% pf.—no par	109¼	105½	109½
Amer. & Foreign Pwr., com.—no par	34¼	22¼	38¾
Amer. Bosch Magneto, com.—no par	35	15¼	35
Amer. Brown Boveri Elec.†	25	10¼	26½
Amer. Brown Boveri Elec., pf. $7	64	40½	65¼
Amer. Gas & Elec., 6% pf.—no par	*k*109	105	108¾
Amer. Gas & Elec., com. †—no par	168¾	117½	184
Amer. Lt. & Trac., 6% pf.	115¾	114¾	118
Amer. Lt. & Trac., new com.	225	170	249
Amer. Pwr. & Lt., 6% pf.	107¾	104	109¼
Amer. Pwr. & Lt., com. †—no par ex.div.	85½	62½	95
Amer. Pub. Serv., 7% pf.	*a*102½	97½	102½
Amer. Pub. Serv., com. †	*k* 65	70	75
Amer. Pub. Utilities, 7% pfc. pf.	*a* 96½	87½	97
Amer. Pub. Utilities, 7% pr. pf.	*k*101	94	101
Amer. Pub. Utilities, com.	*k* 55	60	65
Amer. States Sec., A	*a* 12	4	13¾
Amer. States Sec., B	*k* 14½	4¾	17½
Amer. Superpwr., 6% 1st pf.	*l* 104	...	...
Amer.Super pwr., Class A†—no par	42½	36¾	56
Amer.Super pwr., Class B†—no par	45½	37	56¼
Amer. Wtr. Wks. & Elec., 6% pf.	105½	101½	106
Amer. W.W. & E., com. new—no par ex.div.	62	52½	70¾
Anaconda Copper cap. $3	70	53¼	74¾
Appalachian Electric Pwr., 7% pf.	109	108½	110
Arkansas Pwr. & Lt. 7% pf	108	107½	111
Assoc. Gas & Elec., $3.50—50	54½	...	...
Assoc. Gas & Elec., pf.—$6—no par	97	96	98½
Assoc. G. & E., Class A, 10—no par	49	...	...
BABCOCK & WILCOX, 7% com.	123	117½	127
Binghamton L., H. & P., $6 pf.	107½	102	109½
Birmingham Elec., pf.—$6—no par	107	104	107
Blackstone Valley G. & E., 6% pf.	*k*109	106	112
Blackstone Valley Gas & Elec., 10% com.—50	*k*170	135	170
Blaw-Knox, com.†	*i* 99½	91	105
Brazilian Trac., Lt. & Pwr.,com.,new	*f* 61	...	...
Broad River Pwr., 7% pf.	106	105	108¼
Brooklyn Edison, 8% com.	249	206¾	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	*l* 26	....	.. .
Buffalo, Niagara & East. Pwr. com. $1.20—no par	*l* 42½	.....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	99	98	101
Carolina Pwr. & Lt., pf.—$7—no par	*l*111	109	111
Central & S. W. Util., $7 pf.—no par	*a*104	99¼	105½
Central & S. W. Util., pr. in. $7 pf.—no par	*a*110	103½	112
Central Ark. Ry. & Lt., 7% pf.	106½	105	107½
Central Ill. Pub. Serv., $6 pf.	*a* 99½	97½	100½
Central Ind. Pwr., 7% pf.	*a*101½	95	101½
Central Maine Power, 6% pf.	97	96	98½
Central Maine Power, 7%	110	109	112
Central Pwr. & Lt., 7% pf.	110½	104½	110
Central States Elec., 7% pf.	117	104½	121½
Cincinnati Gas & Elec., 5% com.	*g*100½	....	....
Cities Service, $6 pf.—no par	*l* 103½	94½	103½
Cities Service, pf. B—no par	*l* 9½	8½	9½
Cities Service, pf. BB—no par	*l* 97	88½	97
Cities Service com.—20	*l* 67½	54	70½
Cities Service, Bks. Shrs.—10	*l* 33½	26½	34½
Cities Service Pwr. & Lt., 7% pf.	108½	105½	109
Cities Service Pwr. & Lt., 6% pf.	102	95½	102
Cleveland Elec. Illg., 6% pf.	113	113	115½
Cleveland Elec. Illg., 10% com.	423	350	425
Columbia Gas & Elec., 6% pf.	108	107½	110½
Columbia G. & E. com. $5—no par	111½	89½	118½
Columbus Elec. & Pwr., $2 com.—no par	*k* 79	66	79½
Columbus Elec. & Pwr., 7%	109	....	....
Columbus Ry., Pwr. & Lt., 7%	109½	....	....
Columbus Ry., Pwr. & Lt., 7% pf. B	109	....	....
Columbus Ry., P.& L t. com. no par	125	120	125
Commonwealth Edison, 8% com.	*a*186½	165	189
Commonwealth Pwr., 6% pf.	103½	102½	104½
Commonw'th Pwr ., $2, com.—no par	84	62½	87½
Conn. Lt. & Pwr., 8% pf.	121	120	123
Conn. Lt. & Pwr., 7% pf.	117½	118	121
Cons. Gas of N. Y., pf.	103½	101½	105
Cons. Gas of N. Y., com. $5—no par. ex.div.	152	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	*a*111	110	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 5% pf.	*a*105	100½	105½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par	*a* 85	67½	93
Consolidated Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	104½	106	107
Consumers Pwr., 6.6% pf.	105	106	107
Continental Gas & Elec., 7% pr. pf.	108½	106½	108½
Contl. G. & E. com. $4.40—no par	*k*240	240	265
Crocker Wheeler, com.†	54	...	...
Crocker Wheeler, 7% pf.	95	...	...
DALLAS PWR. & LT., 7% pf.	110	110	111½
Dayton Pwr. & Lt., 6% pf.	109¾	108½	110½
Derby Gas & Elec., 7% pf.	102	96	100½
Detroit Edison, 8% com.	191	166½	195
Dubilier Condenser, com.—no par	4½	2½	5½
Duke Pwr., cap	144	130	145
Duquesne Lt., 5% pf.	105	104½	105½
EASTERN NEW YORK UTIL., $7 pf.	*k*110½	111	112½
Eastern States Pwr. B	23	11½	26½
Eastern States Pwr., pf.	*k*100	98	100½
East. Tex. Elec., 7% pf.	108	106	109
Edison Elec.of Boston, $12 com.	*d*297½	252	301
El Paso Elec. 7% pf.	110	110	112½
Elec. Bond & Share, 6% pf.	*l*110	108¾	111¾
Elec. Bd. & Sh. Sec., com. $1—no par ex. rights	*l*110½	76	127½
Electric Household Util.†	*a* 22½	13½	25
Elec. Investors, 6% pf.—no par	104½	101	104½
Elec. Investors, com.†—no par	68¾	40½	79½
Elec. Pwr. & Lt., ctfs. pf.	109¾	106½	110½
Elec. Pwr. & Lt., ctfs., 40% pd	*m*127	120½	129½
Elec. Pwr. & Lt., ctfs., com.—no par	40	28¼	45¼
Elec. Ry. Securities, com.—no par	6¼	....	....
Elec. St. Battery com. $5.25—no par	80¼	69	84¼
Elmira Wtr., Lt. & R.R., 7% pf.	105	104	107
Empire Pwr., pte.†	37½	27¼	39½
Engr. Pub. Serv. $5, pf.—no par	*k*100	99½	102
Engr. Pub. Serv., com.—no par	42	33	46¼
Eureka Vacuum Cleaner, com. $4—no par	*k* 74¼	69	79
FAIRBANKS MORSE, 7% pf.	*k*111	104	114¾
F.-M., com.—$3—no par	44¼	32½	54
Federal Lt. & Trac.,com $1.40	54¼	42	56¼
Federal Lt. & Trac., $6 pf.—no par ex.div.	*k*107½	98	109
Florida Pwr. & Lt., 7% pf.	*k*107½	105	108
Ft. Worth Pwr. & Lt., 7% pf.	*l*114	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	80	75	85
Galveston-Houston Elec., com.	33	31¼	42½
General Cable, Cl.A	75½	56	84½
Gen. Elec. $3 com.—no par	159½	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.) com A $1.50—no par	46	35½	50¾
Gen. G. & E. (Del.) pf. A $8—no par	135	125	144
Gen. G. & E. (Del.) pf. A $7—no par	118	110	120
Gen. G. & E. (Del.) pf. B $7	112½	105½	114½
Gen. Pub. Serv., $7 pf.	98	....	....
Gen. Pub. Serv., com., no par	26½	16¼	29
General Public Utilities, $7 pf.	*k*102½	98	101
Ga. Lt., Pwr. & Rys., com.	*k* 58	55	65
Gt. Western Pwr., 7% pf.	*h*105½	....	....
IDAHO PWR., 7% pf.	110	109	111½
Ill. No. Utilities, 6% pf.	*k* 99	96	100
Ill. Pwr. & Lt., 7% pf.	105½	103	107
Indianapolis Pwr. & Lt., 6¼% pf.	106½	102	107½
Indianapolis Pwr. & Lt., $7 pf.	102	100	105
Ingersoll Rand com.	*k* 96	90	98
Int. Combus. Engr., com. $2—no par	56¼	45½	65¾
Int. Combustion Engr.,7% pf.	*k*105½	103	109
Int. Util., Class A—$3.50—no par	48	44½	52
Int. Utilities, Class B—no par	16¼	6¼	17½
Interstate Pwr., pf.—$7—no par	104½	99	103½
Interstate Pub. Serv., 7% pf.	106	103	106½
Iowa Ry. & Lt., 7% pf.	101	102	103
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	107½	106	107½
Johns-Manville, com.†—no par	123½	111¼	134
Johns-Manville, 7% pf.	*m*122½	119½	121½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, May 19. *l*Bid price Wednesday, May 23. *m*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 22	Low 1928	High 1928
KANSAS CITY POWER & LIGHT pf. $7	k109	109	114
Kansas Gas & Elec. 7% pf.	i110	107	110
Kelvinator Corp.	19	11¼	22
Kentucky Hydro-Elec., 7% pf.	a104	102	104½
Kentucky Sec., 6% pf.	95	94	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	105	100	105
LACLEDE GAS LT., 10% com.	k 210	200	260
Lehigh Pwr. Sec., com.—no par	37	19½	40
Long Island Ltg., 7% pf.	k111	109½	112½
Long Island Ltg., 6% pf.	k108½	107	109
Long Island Ltg., com.†—no par	k250	170	250
Los Angeles Gas & Elec., 6% pf.	112	105½	112½
Louisville Gas & Elec., cl. A. $1.75	37½	28	4[illegible]
MAN. ELEC. SUPPLY, cap. $5—no par	57½	50	61
Maytag Co., com. $0—no par	36½	30	40½
Memphis P. & L., pf.—$7—no par	110	109	111
Metropolitan Ed., pf.—$6—no par	107½	103	109½
Metropolitan Ed., pf.—$7—no par	109½	109	111½
Metropolitan Ed., com. $8—no par	k170	125	185
Middle West Utilities, 6% pf.	a 99½	93½	100½
Middle West Util., 6% pr. lien	a107	99	108
Middle West Util., com. $7—no par	a152	123½	169
Midland Utilities, pr. in. 6% pf.	a 96½	94½	97
Midland Utilities, 6% pf. A	a 90½	89½	92½
Milwaukee Elec. Ry. & Lt., 7% pf.	105	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	100	98	110
Minn. Pwr. & Lt., 7% pf.	i108½	107	109
Miss. River Pwr., 6% pf.	k112	94	112½
Miss. River Pwr., 3% com.	112	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	k107	100	110
Mohawk Hudson Pwr., 2d pf.—$7—no par	k105	100	110
Mohawk Hudson Pwr., com.—no par	45	29½	53
Montana Pwr., 5% com.	169	102½	175
Montreal Pwr., 7% com.	f110	....	....
Mountain States Pwr., 7% pf.	k104	97	105
Mountain States Pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	110½	98	110½
National Carbon, 8% pf.	m136½	136½	139½
National Elec. Pwr., A†	a 37	27½	42
National Lt., Ht. & Pwr., com.	m 24	20	30
National Pwr. & Lt., pf.—7%	103½	108½	111
National Pwr. & Lt., com.†—no par, ex. div.	32	21½	36½
National Pub. Serv., 7% pf.	102½	99	103
National Pub. Serv., 7% ptc., pf.	114	....	....
National Pub. Serv., A com. $1.60—no par	28	22	29½
National Pub. Serv., B com.—no par	33½	24½	34½
Nebraska Pwr., 7% pf.	f110½	110	111½
Nevada-Calif. Elec., com.	42½	33½	42
New Brunswick Pwr., 4% pf.	64	60	70
New Eng. Pub. Serv., pr. in. pf. $7	110	98½	110½
New Eng. Pub. Serv., pf. $7	98	95	108
New Orleans Pub. Serv.—7% pf.	108½	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	100
N. Y. Central Elec., 7% pf.	105	101	105½
New York Power & Light 7% pf.	114½	....	....
NiagaraFalls Pwr., 7% pf.—25	28½	27½	29
No. Amer., 6% pf.—50	55	53½	55½
No. Amer., com.—10	72½	58½	78½
No. Amer. Edison, $6 pf.—no par, ex. div.	103½	102½	105½
Northeastern Pwr., com.	29½	19½	31
No. N. Y. Utilities, 7% pf.	108	103	109
No. Ohio Pwr., com.—no par	28½	18	32
Northern Ohio Pwr. & Lt., 6% pf.	100	90	99
No. Ont. Lt. & Pr. 6% pf.	k100	94	100
No. Ont. Lt. & Pwr., 4% com.	m 72	73	78
No. States Pwr. (Del.), 7% pf.	109	101	110
No. States Pwr. (Del.), 8% com.	144½	123	152
No. Texas Elec., 6% pf.	55	45	70
No. Texas Elec., com.	19	....	....
OHIO BRASS, com. B $4—no par.	93	89	100½
Ohio Brass, 6% pf.	k105	106	111
Ohio Pwr., 6% pf.	108	104	109½
Ohio Pub. Serv., $6 pf.	104	95	105
Ohio Pub. Serv., 7% pf.	112	107	112
Ohio River Edison, 7% pf.	109	106	109½
Oklahoma Gas & Elec., 7% pf.	114½	106	115½
PACIFIC Gas & ELEC., 6% pf.	28½	25½	23
Pacific Gas & Elec., 8% new com.	50½	43½	53½
Pacific Pwr. & Lt., 7% pf.	i110	106	110
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 81	79½	82
Penn-Ohio Edison, 6% pf. no par	98½	93½	100
Penn-Ohio Edison, 7% pf.	108	97½	109
Penn-Ohio Pwr. & Lt., 7% pf.	111	....	....
Penn Pwr. & Lt.—$7—no par	i110	109½	110½
Penn Wtr. & Pwr., $2.50 com., new	e 85½	68	90
Phila. Co., 5% pf.—50	k 46½	45½	48½
Phila. Co., 6% pf.—50	55	52	57
Phila. Co., com.—50	k170	145	174½
Phila. Elec., 8% com.—25	c 69½	55½	74½
Portland Elec. Pwr., 7% pf.	105	100	104½
Portland Elec. Pwr., 6% pf.	95	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr., com.	45	42½	52
Potomac Elec. Power, 6% pf.	i111½	....	....
Pwr. Sec., pf.—no par	60	50	68
Pwr. Sec., com.—no par	k13½	11½	14½
Public Serv. of Colorado, 7% pf.	108	....	....
Pub. Serv. of N. J., 6% pf.	112	103½	115
Pub. Serv. of N. J., 7% pf.	126½	118	129½
Pub. Serv. of N. J., $2 com.—no par	58½	41½	66½
Pub. Serv. of No. Ill., 6% pf.	a110½	110	115
P. S. of No. Ill., com. $8—no par	a189	159½	189
Pub. Serv. of No. Ill., $8 com.	a186½	159½	186½
Pub. Serv. of Okla., 7% pr. in.	109½	100	107
Pub. Serv. Elec. & Gas, 6% pf.	k109½	108	110½
Puget Sound Pwr. & Lt., 7% pf.	k110	105	109
Puget Sound Pwr. & Lt., $6 pf.—no par	102	92	105½
Puget Sound Pwr. & Lt., com.	70	34½	84½
RADIO CORP. OF AMER., $3.50 pf.—50	k 59½	54½	60
Radio Corp. of Amer., com.—no par.	180½	85½	211
Rochester Gas & Elec. 6% pf. D.	107½	105½	106½
Rochester Gas & Elec., 7% pf. B.	107½	105	107
Rochester Gas & Elec., 6% pf. C.	106	105½	106½
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	117	110	117½
St. Joseph Ry., L., H. & P., 5% pf.	k 75	70	75
Servel, Inc.	k 16½	4½	16½
Sierra Pacific Elec., 2% com.	k 39	29	40½
Sioux City Gas & Elec., 7% pf.	106½	100	108½
Southeastern Pwr. & Lt., pf.—$7—no par	i 109	....	....
Southeastern Pwr. & Lt., ptc. pf.	i 89½	....	....
Southeastern Pwr. & Lt., com.—no par	55½	40½	61
So. Calif. Edison, 8% pf.	49	38½	41
So. Calif. Edison, 7% pf.	30	28½	30
So. Calif. Edison, 6% pf.	27	25½	28
So. Calif. Edison, 8% com.	50	43½	53½
Southern Cities Utilities, 7% pf.	83	75	92
Southwestern Lt. & Pwr., A $3	80	60	80
Southwestern Lt. & Pwr., B.	7[illegible]	60	65
Southwestern Lt. & Pwr., $6 pf.	95½	88	96½
Southwestern Pwr. & Lt., 7% pf.	k112	103	115
Standard Gas & Elec., 8% pf.	71½	65	71½
Standard Gas & Elec., 7% pr. pf.	114½	110½	115
Standard G. & E., com. $3.50	k 69½	57½	74½
Standard Power & Light, com.	k 53	29½	53
Standard Pwr. & Lt., 7% pf.	k107	103½	107½
Staten Island Edison, pf.—$6—no par	102½	99	103½
Superheater, $6 com.—no par	154	155	178
Syracuse Lighting, 7% pf.	110	103	112½
Syracuse Lighting, 8% pf.	k117½	114	119
TAMPA ELEC., com. $2	k 68½	62	71
Tenn. Elec. Pwr., 6% pf.	103	92	103
Tenn. Elec. Pwr., 7% pf.	109	107	110
Tex. Pwr. & Lt., 7% pf.	i114	113½	115
Tide Water Pwr., 8% pf.	111½	108	112
Timken Roller Bear., com.—$4 no par	123½	112½	134
Toledo Edison, 7% pf.	109½	108	111
Toledo Edison, 6% pf.	105	95	105
Toledo Edison, 6% com.	k145	120	150
Tri-City Ry. & Lt., 6% pf.	90	88	102
UNITED GAS & ELEC., 7% pf.	96	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., 8% com.—50	c140½	114½	149½
United Lt. & Pwr., pf.—$4—no par.	k 56½	49	56½
United Lt. & Pwr., pf.—$6.50—no par	101½	94½	103½
United L. & P., com. A .48—no par.	k 24	13½	26½
United L. & P., com. B .48—no par.	k 26	16	30
Utah Pwr. & Lt., 7% pf.	i112	109½	112
Utica Gas & Elec., 7% pf.	105	105	106½
Utica Gas & Elec., 8% com.	k200	215	225
Utilities Pwr. & Lt., 7% pf.	102½	98	103
Utilities Pwr. & Lt., com. A $2	40½	28½	44½
Utilities Pwr. & Lt., com. B $1—no par	28½	18½	30½
VERMONT HYDRO-ELEC., 7% pf.	99	95	102
Virginia Elec. & Pwr., 7% pf.	k110½	108	111
Virginia Public Service 7% pf.	102½	97	103½
WAGNER ELEC., 7% pf.	b106	96½	106
Wagner Elec., com.—no par	b 85	37	120
Washington Ry. & Elec., 7% com.	j450	....	....
Washington Ry. & Elec., 5% pf.	j100½	....	....
Washington Wtr. Pwr., 5% com.	225	175	235
West Penn Elec., 7% pf.	114	109½	115
West Penn Elec., Cl. A $7	109½	106½	112
West Penn Pwr., 7% pf.	115½	114½	117
West Penn Pwr., 6% pf.	110½	108½	113
West Virginia Lt., Ht. & Pwr., 7% pf.	95	94	100
Western Pwr., 7% pf.	104	98	105
Western States Gas & Elec., 7% pf.	k104	100	106
Western States Gas & Elec., com.	m 38	....	....
Westinghouse Elec. & Mfg., 8% com.—50	102½	88½	112
Weston Elec. Instrument, Cl. A $2—no par	k 33	30½	34½
Weston Elec. Instrument, com.—no par	16	12½	18½
Wheeling Elec., 6% pf.	106	95	109
Worthington Pump, 7% pf. A	k 52	46½	58½
Worthington Pump, 6% B.	k 47½	41	51
Worthington Pump, com.	33	28	36½
YALE & TOWNE com. $5—25.	75	68½	84½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, May 19. lBid price Wednesday, May 23. mLatest quotations available. †Dividend rate variable.

shares of $100 par value to 241,132 shares of $25 par value and the distribution of four new shares for each share now held. They also voted to authorize the creation and issuance of 120,000 additional $25 par common shares to be sold to common stockholders of record May 8 at par in the ratio of one new share for each five shares held.

CONSUMERS POWER ELECTS NEW DIRECTORS.—At a meeting of the board of directors of the Consumers Power Company R. P. Stevens and T. A. Kenney were elected members of the board.

MASSACHUSETTS LIGHTING ELECTS NEW TRUSTEES.—Philip Young of the banking house of Baker, Young & Company, Boston, and George F. Howland, treasurer of the Massachusetts Lighting Companies, were elected trustees of the last-named organization at the recent annual meeting in Boston. Philip Childs and Henry I. Harriman were re-elected trustees.

METROPOLITAN EDISON STOCK ON NEW BASIS.—The Metropolitan Edison Company declared a quarterly dividend of $2 a share on the common stock payable March 24 to holders of record March 15. This places the stock on an $8 basis, compared with $7 previously.

JAPAN UTILITY TO REFUND.—The Tokio Electric Light Company is planning a refunding operation that will involve $24,000,000 by offering new securities, proceeds from the sale of which will be used to retire 6 per cent notes maturing in August. Part of the issue will be offered in Japan.

NIAGARA UTILITIES PREPARE FOR MERGER.—The Tonawanda Power Company, the Niagara Falls Power Company and the Niagara, Lockport & Ontario Power Company have called their outstanding preferred stocks. The class A and class B preferred stocks of the Tonawanda company will be redeemed July 2 at $27.50 and $25.50 a share and accrued dividends; the Niagara, Lockport & Ontario preferred will be redeemed June 30 at $26.25 a share and accrued dividends and the Niagara Falls preferred will be redeemed on June 30 at $27.50 a share and accrued dividends. Holders of these various stocks may exchange them until June 1 for first preferred stock of for Buffalo, Niagara & Eastern Power Corporation, with which company the other companies are presently to be merged.

The Electrical Industry in Europe

Per capita expenditures for electrical goods and estimates of energy generated—in most instances during 1925—in various European countries have recently been published by the Department of Commerce and are here reproduced. The figures were obtained from the Documentation on the Electrical Industry at the Geneva Conference of 1927.

PRODUCTION OF ELECTRICITY IN EUROPEAN COUNTRIES

Country	Per Capita, Expenditure for Electrical Goods	Generation of Electrical Energy Annually, Millions of Kilowatt-Hours
Germany	$6.72	22,000
France	2.31	9,800
Belgium	2.52	1,700
Great Britain	6.26	11,000
Italy	1.02	7,600
Spain	0.86	*
Netherlands	1.26	900
Switzerland	4.90	3,900
Austria	3.48	1,600
Czechoslovakia	1.33	850
Hungary	1.10	710
Russia	0.14	4,100
Poland	0.23	1,300
Finland	1.95	233
Sweden	2.64	3,500
Norway	2.69	6,200
Denmark	2.00	350

* No statistics available.

PUBLIC SERVICE TO DOUBLE PREFERRED SHARES.—The Public Service Corporation of New Jersey has called a special meeting of stockholders for May 28 to vote on a proposed increase in the authorized preferred stock from 2,000,000 shares to 4,000,000 shares, the additional shares to be no-par $5 dividend stock. This is the first preferred stock issue of the company without par value. The preferred stock now authorized consists of 250,000 shares of 8 per cent cumulative preferred, 500,000 shares of 7 per cent cumulative preferred and 1,250,000 shares of 6 per cent cumulative preferred stock, all of $100 par value. There are also 10,000,000 shares of no-par common stock authorized.

INGERSOLL-RAND EXTRA DIVIDEND.—The Ingersoll-Rand Company recently declared an extra dividend of $1 in addition to the regular quarterly dividend of 75 cents on the common stock.

World's 33,000,000 Hydraulic Horsepower

THE developed water power of the world, according to estimates of the U. S. Department of the Interior through the Geological Survey, was about 23,000,000 hp. in 1920, 29,000,000 hp. at the end of 1923 and 33,000,000 hp. at the end of 1926, an increase of 43 per cent in six years. About three-fourths of the increase for the last three years has been in the English-speaking section of North America.

The estimates here given are considered sufficiently accurate to afford a rough idea of the potential water-power resources of the world and the extent of their development, although it is difficult to co-ordinate estimated water power for the several countries, particularly estimates of potential water power, because of differences in their elements and character and in the completeness and accuracy of the data on which they are based. The figures for the developed water power represent the rated capacity of waterwheels or turbines installed, and the figures for the potential power represent the total power that could be obtained at ordinary low water, including the power already developed. The installed capacity usually amounts to two or three times the power available at low water.

The figure for the developed water power in the United States includes only plants having a capacity of 100 hp. or more and is based on excellent data; the corresponding potential power is the amount available 90 per cent of the time at 70 per cent efficiency.

TABLE I—THE WORLD'S WATER POWER BY CONTINENTS

Continent	Developed Horsepower	Potential Horsepower
North America	16,800,000	66,000,000
South America	750,000	54,000,000
Europe	13,100,000	58,000,000
Asia	2,100,000	69,000,000
Africa	14,000	190,000,000
Oceanica	240,000	17,000,000
Approximate total	33,000,000	454,000,000

Table II—Summary of Potential and Developed Water Power in 1926, by Countries

(Estimated by the United States Geological Survey)

North America		
Country	Developed Horsepower	Potential Horsepower
Mexico	300,000	6,000,000
United States	11,721,000	35,000,000
Alaska	43,000	1,000,000
Newfoundland	160,000	400,000
Canada	4,556,000	18,250,000
Costa Rica	15,000	1,000,000
Guatemala	4,000	1,500,000
Honduras	3,000	1,000,000
Nicaragua	400	800,000
Salvador	2,700	200,000
Panama	13,300	500,000
West Indies	19,350	150,000
Approximate total	16,800,000	66,000,000

South America		
Argentina	25,000	5,000,000
Bolivia	13,500	2,500,000
Brazil	500,000	25,000,000
British Guiana	.....	2,500,000
Dutch Guiana	.....	800,000
French Guiana	.....	500,000
Chile	114,000	2,500,000
Colombia	25,000	4,000,000
Ecuador	5,500	1,000,000
Paraguay	200	2,000,000
Peru	55,000	4,500,000
Uruguay	.....	300,000
Venezuela	13,000	3,000,000
Approximate total	750,000	54,000,000

Europe		
Sweden	1,350,000	8,000,000
Norway	1,900,000	9,500,000
Finland	220,000	1,800,000
Russia	230,000	3,000,000
Esthonia	16,950	125,000
Latvia, Lithuania	5,000	100,000
Poland	90,000	1,400,000
Ukraine	40,000	425,000
Region of the Caucasus	5,000	5,000,000
Hungary	3,000	175,000
Czechoslovakia	155,000	1,000,000
Yugoslavia	180,000	3,000,000

Europe (continued)		
Country	Developed Horsepower	Potential Horsepower
Austria	325,000	1,660,000
Rumania	30,000	1,600,000
Bulgaria	18,000	1,200,000
Greece	8,000	250,000
Turkey	.....	Small
Albania	1,000	500,000
Italy	2,300,000	3,800,000
Switzerland	1,850,000	2,500,000
Germany	1,100,000	2,000,000
France	2,000,000	5,400,000
British Isles	250,000	850,000
Belgium	700	Small
Denmark	11,000	9,000
Netherlands	150	Small
Spain	1,000,000	4,000,000
Portugal	10,000	300,000
Iceland	.....	500,000
Approximate total	13,100,000	58,000,000

Asia		
Chinese Republic	1,650	20,000,000
India	200,000	27,000,000
Asia Minor	500	500,000
Arabia	.....	.....
Persia	.....	200,000
Afghanistan	2,000	500,000
Siberia	90,800	8,000,000
French Indo-China	.....	4,000,000
Siam and Malay States	4,500	4,000,000
Chosen	18,300	500,000
Japan	1,750,000	4,500,000
Approximate total	2,100,000	69,000,000

Africa		
Tangier	.....	50,000
Morocco	.....	250,000
Algeria	130	200,000
Tunisia	.....	30,000
Tripoli	.....	Small
Eritrea	.....	Small
British Somali	.....	Small
Italian Somali	.....	Small
Gold Coast and British mandate in Togo	.....	1,450,000

Africa (continued)		
Country	Developed Horsepower	Potential Horsepower
Liberia	.....	4,000,000
Sierra Leone	.....	1,700,000
Senegal	.....	250,000
Rio de Oro	.....	Small
Gambia	.....	Small
Portuguese Guinea	.....	Small
Union of South Africa	5,000	1,600,000
Angola	4,000	4,000,000
Southwest Africa (Union of South Africa mandate)	.....	150,000
Belgian Congo and Belgian mandate	250	90,000,000
French Congo	.....	35,000,000
French mandate in Cameroon	.....	13,000,000
Nigeria and British mandate in Cameroon	.....	9,000,000
Rhodesia	2,500	2,500,000
Tanganyika (British mandate)	800	2,700,000
British Central Africa	.....	1,200,000
British East Africa	900	4,700,000
Portuguese East Africa	.....	3,700,000
Bechuanaland	.....	20,000
Abyssinia	.....	4,000,000
Egypt	.....	600,000
Ivory Coast, Dahomey, and French mandate in Togo	.....	2,850,000
French Guinea	.....	2,000,000
French Sudan	.....	1,000,000
Madagascar	100	5,000,000
Approximate total	14,000	190,000,000

Oceanica		
Australia	2,000	600,000
New Zealand	60,000	2,500,000
Philippine Islands	.....	1,500,000
Sumatra	20,000	2,000,000
Java	60,000	750,000
Borneo, including New Guinea and Papua	.....	7,500,000
Tasmania	75,000	700,000
Celebes	500	1,000,000
Hawaii	25,000	100,000
Approximate total	240,000	17,000,000

Business News and Market Conditions

Operations Materially Increase During April

Rate of Production in Electrical Manufacturing Plants 18 per Cent Over April of Last Year—Smaller Manufacturers Report 16.4 per Cent Gain During April Over March

DURING April the electrical manufacturing plants of the nation reported that productive operations as indicated by the consumption of electrical energy were materially above those of March and only slightly below the record peak of activities recorded in October last year. A radical upward turn in the rate of operations in these plants was hardly to be expected at this season of the year, if the operations of past years is to be taken as a criterion. April rate of operations, after corrections are made for the number of working days, was about 11 per cent above that reported for March and about 18 per cent above that of April last year. The average rate of operations of these electrical manufacturing plants during the first quarter of the current year was about 5 per cent above that for the same period last year.

The smaller electrical manufacturing plants reported a much greater increase in rate of operations during April than was reported by the larger companies. The April rate of production by the smaller plants was 16.4 per cent over that of March, a large number of these companies reporting a greater consumption of electrical energy during April than during March, in spite of the fact that April had two less working days than March. The larger companies reported a rate of production during April only 1.4 per cent above that of March.

The index of activity in the electrical manufacturing industry based on the consumption of electrical energy stands at 128.4 for April, as compared with 115.3 for March and 131.3 for the record month of October, 1927. Comparative indexes of productive activity referred to the average productive activity for the period 1923-25 as 100, and adjusted for number of working days, are as follows:

April, 1928	128.4
March, 1928	115.3
February, 1928	121.8
October, 1927 (peak month)	131.3
April, 1927	108.9
April, 1926	107.8

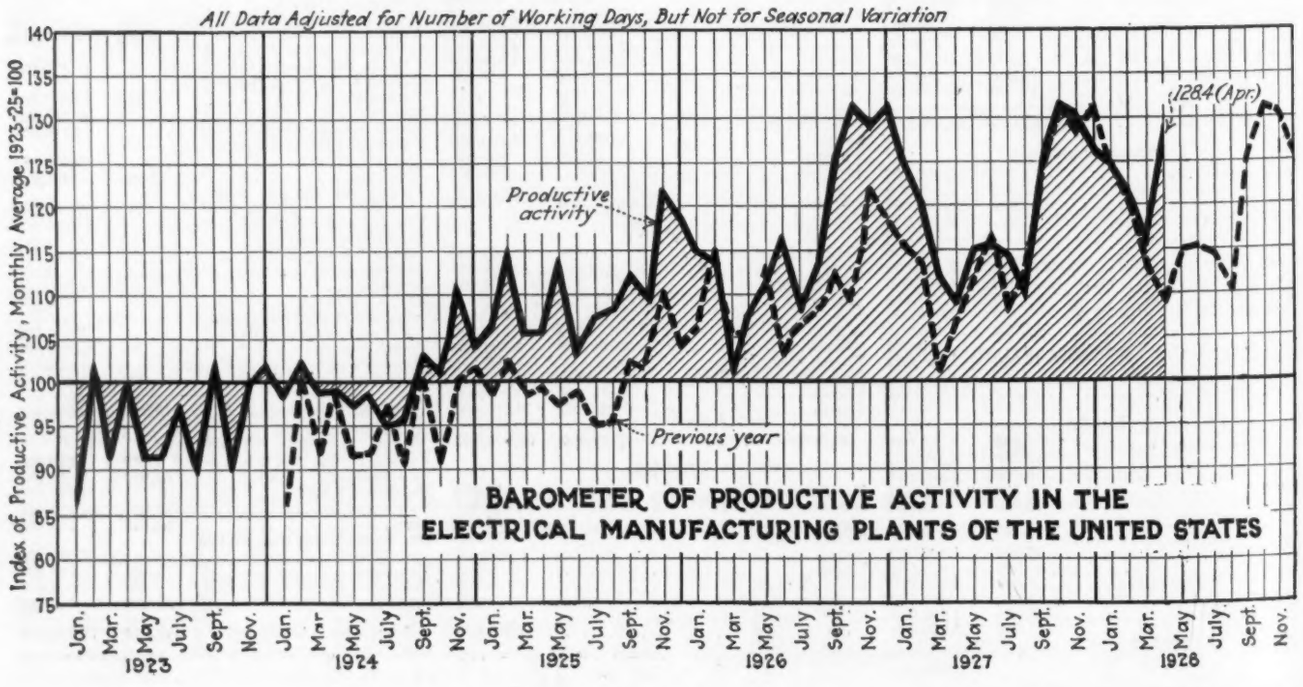
General industry also recorded an upward swing in the rate of operations during April. The April rate of general industrial operations for the country as a whole was close to 1 per cent greater than that witnessed in March and was about 2.2 per cent over April of last year. Industrial operations are being well sustained, some of the outstanding industrial groups recording increased operations, when a slight seasonal decrease would be expected normally. The favorable industrial situation is reflected by the fact that during the first four months of the current year the average rate of activity of general industry was about 3.7 per cent above that during the same period in 1927.

Building Industry to Stabilize Credit Conditions

To correct improper practices and to stabilize credit conditions in the building construction industry, representative sub-contractors and general contractors have joined in the Allied Construction Industries Committee, a new body recently formed at a meeting in Washington, D. C. Members of the committee, representing thirteen national associations, are to meet at Detroit next month to advance the work already accomplished and to give a more definite form to the program for future activities. The organization includes members of the executive committee of the Associated General Contractors of America and two representatives from a number of trade organizations including the Elevator Manufacturers' Association and the Association of Electragists, International.

George B. Walbridge, Detroit, former president of the Associated General Contractors of America and chairman of the committee, presided at the organization meeting and submitted a report of that session to the full conference.

In addressing the conference, Mr. Walbridge declared "hundreds of concerns operating in the construction industry are in a state of perpetual insolvency. They secure materials and



equipment under loose credits, reaping their profits by failure to pay their bills and by using inferior materials and workmanship." Foremost among the measures to be given consideration at the Detroit meeting next month will be the formulation of rules of ethical practices. Establishment of a rational credit system also will be undertaken as a primary move.

Market Conditions

SLOW but steady progress is registered by the electrical industry so far in 1928, although sales have been spotty in some districts. In fact, some manufacturers have even termed business as slow, yet they are optimistic. There appears to be a definite trend to greater activity on the part of industrial plants, and much electric railway business is in sight. The inquiries in the market and the active projected business bear out an optimistic feeling.

In New England the sales volume is expanding. A number of orders for heavy industrial equipment are pending. Industrial business is becoming more active in the Eastern district. Major industrial projects include a cement mill in Ohio, to cost $1,000,000; an automobile assembling plant in Missouri, to cost $1,500,000; an aircraft plant in Ohio, to cost $1,200,000. A soap manufacturer in Baltimore plans the purchase of considerable equipment for a factory to cost $3,000,000. Central-station purchases are limited to immediate requirements. Volume of business as well as prospects look good in the Southeast district. An order was placed for oil circuit breaker equipment amounting to $40,000. A central-station company closed a contract for 45 electric refrigerators for an apartment house installation, while many street-lighting projects are reported. A slight improvement is noted in the St. Louis district. Better business is reported in the Middle West. Maintenance purchasing of central-station companies are quite heavy. A prominent utility company is buying at the rate of $92,000 per day. On the Pacific Coast a good deal of construction work is planned, although buying is comparatively slow. A large paper plant will be built in Port Townsend, Wash., at a cost of $3,000,000.

Non-Ferrous Metals Strong in Sellers' Market

Metal producers are well satisfied with the trend of the market during the last week. Copper sales have dropped off to close to average in the domestic market, but the price has advanced and sellers have little to offer. Zinc has been exceedingly quiet, but the metal is so firmly held that prices have advanced a few points further. Lead and tin prices show little change, but the activity in each of these metals has been greater than last week.

NEW YORK METAL MARKET PRICES

	May 16, 1928 Cents per Pound	May. 23, 1928 Cents per Pound
Copper, electrolytic	14.15–14.175	14.375
Lead, Am. S. & R. price	6.10	6.10
Antimony	11¼	11.125
Nickel, ingot	35	35
Zinc spots	6.40	6.475
Tin, Straits	52¼	51.625
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price May 23, 1928, 16¼ cents.

Volume of Business Increasing in the Southeast

While the past week witnessed an increase in the volume of small business in the Southeast, a few large orders were reported. One order was for oil circuit breaker equipment amounting to $40,000. An order for three 500-kw. and six 150-kw. transformers will probably be placed shortly. A central-station company closed a contract for 45 electric refrigerators for an apartment house installation, while another company has closed twelve apartment house jobs ranging from six to 24 units per installation, and several other similar installations are pending.

A cotton mill in Georgia will build an addition to its warehousing facilities and a contract will probably be let within a few weeks. Wiring supplies aggregating $4,000 will go into this job. A municipality in Louisiana ordered "white-way" equipment amounting to $4,000, while towns in Alabama and Georgia ordered similar equipment amounting to $3,500 and $2,000, respectively. Two $3,000 "white-way" orders from Georgia towns are in immediate prospect. Jobbers report good business, particularly in supply lines. Construction projects are as follows:

Swift & Company, Chicago, plan a vegetable oil refinery at Jacksonville, Fla., to cost $200,000. Miami, Fla., plans a municipal airport to cost $1,000,000. The C. J. Patterson Corporation, Kansas City, Mo., will build a baking plant at Atlanta, Ga., to cost $100,000. The Georgia Power Company, Atlanta, Ga., has acquired municipal power plant at Winder, Ga. Paducah, Ky., plans the installation of a municipal power plant and has authorized surveys.

The Mississippi Power Company, Gulfport, Miss., plans a transmission line from Richton to McLain and vicinity, 20 miles, and from Richton to Hattiesburg, 25 miles, and will install substation equipment. The Southern Public Utilities Company, Charlotte, N. C., is negotiating for the purchase of the municipal power plant at Huntersville, N. C. The Carolina Cement Company, New Bern, N. C., plans a power plant of 5,000-kva. capacity in connection with a proposed cement mill. Miami Beach, Fla., will receive bids until June 6 for an ornamental lighting system.

New England Sales Volume Expands

Not only is the current trend of sales steady in New England but the outlook for increasing business during the next month is encouraging. Orders for small motors are normal. A number of sales for 50-hp. motors are of interest. Pole line material, wire and cable are in good demand. Several service extensions provide interesting prospects for transmission line equipment. Heavy industrial equipment business is quiet, but a number of orders are pending, one of which includes a complete motor-generator set. Sales of power equipment for freezers, ice crushers and ice-making machinery are active. A prominent preparatory school in Massachusetts is planning to install equipment whose consumption will be 100,000 kw.-hr. annually. Equipment for fish freezers was recently placed in Gloucester, Mass. Construction projects are as follows:

The Twin Gas & Electric Company plans to build 6 miles of 66,000-volt transmission line in Pownal, Vt., at a cost of $30,000. The Bangor Hydro-Electric Company, Maine, will expend $50,000 for service extension. This company will make additions to the Ellsworth plant, including several 1,000 kva. transformers, rebuilding transmission lines in Washington county and on Mount Desert island. The town of Hudson, Mass., will erect a municipal power plant and has purchased three Diesel engines costing $162,000, but has not yet ordered the generating equipment.

Industrial Account Active in Eastern District

Expanding industrial business is reported in the Eastern district. Several extensive projects are soon to mature, while present commitments have reached sizable levels. A cement company is completing plans for a mill in Cuyahoga County, Ohio, to cost more than $1,000,000, while a similar project will soon mature in Illinois. An automobile assembling plant will be built in Missouri to cost upward of $1,500,000, while an aircraft plant is contemplated in an Ohio city to cost approximately $1,200,000. A sulphur company operating in Texas has placed an order for two 750-kw. turbo-generating units. An iron and steel mill in the vicinity of Trenton, N. J., is contracting for motors, control equipment and other apparatus for a new addition.

A manufacturer of soap will ask bids in about four weeks for considerable equipment for a factory at Baltimore to cost upward of $3,000,000. Fractional-horsepower motor business continues satisfactory, with a fair volume of inquiries. Substation apparatus, including switchboard panels and instruments, is being purchased by new office buildings in the metropolitan district; a recent order for this account totaled about $16,000.

Central-station purchases are being limited to immediate requirements and the bulk of transactions is centered in substation apparatus. A manufacturer of transformers states that current trade

is satisfactory and that the heaviest commitments are being secured from light and power companies in the metropolitan district, with inquiries exceptionally good at the moment. A producer of wire and cable reports equally encouraging accounts from metropolitan utilities, covering both substation and transmission line operations.

Transactions in the electrical appliance field show little change and continue on a reduced scale. Vacuum cleaner business has fallen off a little, but electric refrigerator account looms as an important feature of spring sales. Electric supplies for domestic service and insulating products are recording a fair volume of business. Immediate construction activities in the Eastern district include the following:

The New York Central Railroad Company, New York, will receive bids June 1 for a 2,000-kw. rotary converter and a 2,100-kva. transformer, for substation service. The New York Power & Light Corporation, Albany, N. Y., has secured permission to make extensions in transmission lines to Wells, Hope, Benson and vicinity. The Cheektowaga Crushed Stone Corporation, Cheektowaga, N. Y., plans a plant to cost $100,000. The Transogram Company, New York, will build a toy-manufacturing plant at Haskell, N. J., to cost $100,000. The Niagara, Lockport & Ontario Power Company, Batavia, N. Y., has plans for a storage plant at Angola, N. Y., to cost $45,000.

The Western Electric Company plans an addition to its plant at Kearny, N. J., to cost $1,250,000. The Philadelphia Electric Company, Philadelphia, has secured permission to install steel towers for a line in the vicinity of Fox and Westmoreland Streets. The Overbrook Hosiery Mills, Reading, Pa., plans an addition to cost $180,000. The Danville Structural Steel Company, Danville, Pa., will build two additions to cost $300,000. Baltimore, Md., plans an ornamental lighting system. The Consolidated Gas, Electric Light & Power Company, Baltimore, plan extensions in recently acquired property at Havre de Grace, Md. The General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until June 7 for electrical supplies (Panama Schedule 1878).

Sales in St. Louis District Show Slight Improvement

A slight improvement is noted in the St. Louis district. Manufacturers of appliances say that the demand is holding up above that of last year, especially for ranges and other cooking appliances. Stock sizes of motors are in better demand and orders are coming in steadily. An order for substation equipment for south Missouri was placed at a cost of $3,600 and a lot of motors from 5 hp. to 25 hp. amounting to $1,800. Construction projects are as follows:

The Arkansas Power & Light Company, Little Rock, Ark., plans transmission lines at Melbourne, Ark., and vicinity. The Atchison, Topeka & Santa Fe Railway plans a power house at shops at Emporia, Kan., to cost $85,000. Chalona Brothers Packing Company, Buras, La., plans a power plant in connection with its packing house to cost complete $50,000. The Empire District Electric Company, Joplin, Mo., has applied for a permit to construct a hydro-electric plant on the White River. The Inland Utilities Company, Kansas City, Mo., has acquired the municipal power plant at Hooker, Okla. The Harrison-Smith Company, Oklahoma City, Okla., manufacturer of automobile accessories, will build a plant to cost $90,000.

The United States Zinc Company, New York, plans a mill at Amarillo, Tex., to cost $100,000. The Beaumont Import & Export Company, Beaumont, Tex., plans a lumber mill, to cost $100,000. The Valley Bonded Warehouse Company, Brownsville, Tex., plans a cold storage plant to cost $200,000. Denton, Tex., plans a municipal power plant to cost $38,000. The Burford Oil Company, Shreveport, La., plans an oil refining plant at Pecos City, Tex., to cost $600,000. Stamford, Tex., plans extensions in its municipal power plant.

Better Business Outlook Noted in Middle West

While no unusual activity of business is apparent in the Middle West it is generally admitted that business is better, although not up to expectations at the beginning of the year. The automotive, steel and railroad industries are prospering and better business is in view. Maintenance purchasing is quite heavy. Purchases of one utility company average $92,000 a day. Interesting orders include: Complete condensing equipment for use with a 55,000-kw. turbo-generator, soot blowers for six boilers, economizers and air heaters, six forced-draft fans, 500,000 lb. weatherproof wire and cable and 50,000 lb. of busbar copper. There has been a good demand for pole line hardware, one manufacturer reporting last month's sales as the largest in his history. Construction projects are as follows:

The Chicago Rivet & Specialty Company, Chicago, plans a plant to cost $85,000. The Robert O. Law Company, Chicago, will soon take bids for a printing plant to cost $350,000. The Sears Paper Box Company, Danville, Ill., plans a factory to cost $100,000. The Marquette Cement Manufacturing Company, Chicago, plans a mill at Oglesby, Ill., to cost $1,000,000. The Columbia Mills, Inc., West Pullman, Ill., plans addition to textile mill to cost $100,000. The Cleveland, Cincinnati, Chicago & St. Louis Railroad, Cincinnati, Ohio, plans an engine house and shops at Beech Grove, Ind., to cost $200,000. Edinburg, Ind., will receive bids until June 4 for a municipal power plant.

Deer & Company, Moline, Ill., plans an agricultural machinery plant at Waterloo, Iowa, to cost $200,000. Parke, Davis & Company, Detroit, plans additions to drug and chemical works, to cost $2,000,000. The Chevrolet Motor Company, Flint, Mich., plans a group of five plant units at Saginaw, Mich., to cost $10,000,000. The Consumers Power Company, Jackson, Mich., plans a power plant at Grand Rapids, Mich., to cost $500,000. The Dominion Electric Company, Minneapolis, Minn., plans a factory to cost $100,000. The Dayton Power & Light Company, Dayton, Ohio, will soon begin construction of an auxiliary power plant to cost $300,000.

The Ohio Public Service Company, Cleveland, will build an addition to its Edgewater generating plant at Loraine, Ohio, to cost $450,000. The Libbey-Owens Sheet Glass Company, Toledo, Ohio, plans an addition to its plant to cost $750,000. Blair, Wis., plans a municipal power plant. Mankato, Minn., plans extensions in its municipal lighting system. Champaign, Ill., Cedar Rapids, Iowa, and Madison, Wis., plan ornamental lighting systems.

Much Construction Planned on Pacific Coast

Buying is comparatively slow on the Pacific Coast, although projected construction is excellent. Power company purchases have included two carloads of pole line hardware, an indicating voltage regulator for the Bay district, at an installation cost of $12,500, and about 400 assorted small transformers for the week's aggregate business. Arizona construction prospects are very good. Bonds amounting to $4,000,000 were voted for the irrigation and electrification of the Salt River area.

Government construction includes a submarine overhauling plant and battery storage building for Marine Island and the alteration and redistribution of electric and telephone systems in the marine barracks at San Diego. Dealers' business has been only fair. Contracting business has been good, particularly in conduit and boxes.

Immediate construction of the second unit of a Kraft paper plant in Port Townsend, Wash., costing $3,000,000, has been announced by the National Paper Products Company, a Zellerbach subsidiary, and the purchase of two 3,500-hp. turbines was reported. About 100 motors were reported sold by Seattle jobbers. A turbine and fire control equipment was sold to a Grays Harbor mill at a cost of $5,000. Contracts let include approximately $18,000 worth of weatherproof wire by the city of Seattle and an $18,000 street lighting system in Bremerton.

The city of Tacoma is planning a 50,000-volt transmission line between Lake Cushman and the Nisqually substation and extension of distribution lines at an estimated cost of $63,000. Industrial construction announced includes a 250,000-ft. daily capacity sawmill at Klamath Falls, Ore., with a 6,000-hp. power plant by the Weyerhaeuser Timber Company, and a 100,000-ft. daily capacity electrified mill in Centralia by the Centralia Lumber & Manufacturing Company. Construction projects are as follows:

The Los Angeles Gas & Electric Corporation, Los Angeles, plans a storage plant at Alhambra, to cost $55,000. The H. C. Smith Company, Los Angeles, manufacturer of oil well equipment, plans a new plant to cost $100,000. Uttley & Kleindenst, Oakland, engineers, are drawing plans for a cold storage plant to cost $400,000. Eugene, Ore., will receive bids until June 5, for the Leaburg unit of the municipal hydro-electric project, to cost $1,500,000. Ellensburg, Wash., plans addition to its municipal lighting plant. Long Beach, Santa Ana, Los Angeles, Bakersfield, Burbank and Oroville, Calif., plan installation of ornamental lighting systems. The county supervisors, Los Angeles, will receive bids until June 4 for an ornamental lighting system on Whittier Boulevard, estimated to cost $54,500.

Activities of the Trade

General Electric Welding Two New Factory Buildings

Two new factory buildings, all the structural work of which will be arc welded instead of riveted, are now being erected by the General Electric Company. One of these will be an addition to the General Electric plant in Bridgeport, Conn., and the other will be located at the company's Pittsfield, Mass., plant. These mark a second step in the General Electric program, recently announced, of utilizing welding in the construction of its new buildings.

The first General Electric welded building was erected in Philadelphia, as an addition to the switchgear manufacturing plant there. This structure, approximately 140 ft. wide, 600 ft. long and 50 ft. high, contains about 1,000 tons of welded structural work, and is chiefly notable because of the large number of welded trusses used in the roof structure, and the fact that it is the heaviest and largest steel structure thus far welded. The new building at Bridgeport is to be a small, single-story structure, 64 ft. wide and 42 ft. long. The Pittsfield building will be a two-story structure of beam and column construction, about 40 ft. wide by 280 ft. long, and containing about 250 tons of steel. It will be used in the manufacture of molded products.

THE JAMES R. KEARNEY CORPORATION, 4224 Clayton Avenue, St. Louis, manufacturer of overhead and underground utility equipment, announces that Joseph D. P. Hoffman has joined its engineering staff as assistant designing engineer. Mr. Hoffman was formerly with the Southwestern Bell Telephone Company as field exchange engineer.

SERVEL SALES, INC., 51 East 42d Street, New York City, has concluded a contract with the Commercial Investment Trust Corporation of New York City whereby there is available for all Servel and "Electrolux" dealers a modern financing plan for both wholesale and retail refrigerator sales.

THE ROLLER BEARING COMPANY OF AMERICA, Newark, N. J., announces that it has concluded the purchase of the plant of the Mercer Motor Car Company in Trenton, N. J. The Mercer plant occupies 11½ acres and the buildings have 175,000 sq.ft. of floor space.

TORK CLOCKS, INC., 12 East 41st Street, New York, have placed on the market a line of electrically operated clocks that can be furnished for any voltage for either alternating or direct current use and which have a reserve of 24 hours to take care of possible interruptions to current. They are guaranteed for unusual timekeeping accuracy under all ordinary temperature conditions. The line includes wall clocks for stores and offices, double faced hanging clocks, and double faced street clocks. There is also a program signal wall clock which will ring a program of bells on any daily schedule desired.

THE KUHLMAN ELECTRIC COMPANY, Bay City, Mich., manufacturer of power, distribution and street lighting transformers, announces the appointment of the Enterprise Electric Company, 1425 M Street, Lincoln, Neb., as its representative. The Enterprise company will carry a stock of transformers.

THE JOSLYN COMPANY, Chicago, manufacturer of pole-line material and wiring equipment, has appointed J. J. Costello of 201 Devonshire Street, Boston, as its New England selling agent. Mr. Costello also represents the Electric Power Equipment Corporation and the Philadelphia Electric & Manufacturing Company, both of Philadelphia.

THE CONSOLIDATED ELECTRIC LAMP COMPANY, Danvers, Mass., has purchased the plant of the A. M. Creighton Company, Broad Street, Lynn, Mass. It is announced that the Danvers organization will start operations in Lynn about July 1 with the installation of new machinery in the new plant and the gradual abandonment of the Danvers location. The new plant has a floor space of 100,000 sq.ft.

THE NATIONAL LAMP WORKS OF THE GENERAL ELECTRIC COMPANY, Nela Park, Cleveland, has developed a two-filament incandescent lamp for miners. The two filaments operate at different intensities. The major filament, giving 14 beam candlepower of light, is used until it fails. Then a simple switch, attached to the side of the lamp, is turned to throw the current into the low-candle power emergency filament.

THE BENJAMIN ELECTRIC MANUFACTURING COMPANY, 120 South Sangamon Street, Chicago, announces that Gordon E. Bloom has been appointed field sales director of its refrigerator division. Mr. Bloom was formerly with the Copeland Products Company at Chicago. The company also announces that A. W. Kakitty has joined the illuminating engineering department.

THE ROME WIRE COMPANY, Rome, N. Y., a division of the General Cable Corporation, announces that L. A. Zima has joined the staff as district engineer in the New York office. Mr. Zima was formerly cable engineer with the Brooklyn Edison Company.

THE FITZGERALD MANUFACTURING COMPANY, Torrington, Conn., manufacturer of "Star-Rite" electrical appliances, announces that it has placed on the market the new "Star-Rite Empress" waffle iron exclusively equipped with a heat indicator. The company also has placed on the market the "Star-Rite Hand Vac," a light hand-held vacuum cleaner.

Armstrong Company Adds Directors and Changes Name

C. C. Armstrong of the Armstrong Manufacturing Company of Huntington, W. Va., announces that the company's name has been changed to the Armstrong Electric & Manufacturing Corporation. With this change a number of new directors have been brought into active participation in the company. Mr. Armstrong states that the company will now be able to concentrate new manufacturing, financing and merchandising facilities on Armstrong products while at the same time developing new products. The first of these new products is expected to be ready for formal announcement during the summer and for delivery in the early fall. The company is now producing its table stove in bright colors in addition to white.

At the meetings of the new Armstrong board of directors there now appear the following new directors: Thomas E. Spence; William S. Yerkes, vice-president and director of the General Outdoor Advertising Company; William C. Beckers, director of the Allied Chemical & Dye Corporation; J. Roy Allen, director of the American Hide & Leather Company; C. R. Berrien, vice-president of the Central Union Trust Company, New York; Hubert K. Dalton, president of the Dalton Tool Corporation; Gardner B. Perry; Harold Will, vice-president of the Will & Baumer Candle Company, and W. R. Westerfield, director of R. F. Westerfield & Company.

Thomas E. Spence, who has been an official of a public utility company and who has more recently been associated with the Hamilton Beach Company, has been elected president of the Armstrong corporation. Mr. Armstrong will be personally in charge of research and development of new products and equipment, and in addition to the active services of the directors named above the corporation will have the close co-operation of a number of important associates, each of whom has taken a financial interest in the business.

FOSTORIA, INC., New York City, manufacturer of lighting fixtures and electrical supplies, has leased the building at 59 West Fourteenth Street. The company has installed modern showrooms where it will display its complete line of merchandise.

THE UNION ELECTRIC MANUFACTURING COMPANY, Milwaukee, manufacturer of control equipment, announces that it has appointed the Frederick Rall Company, Inc., 52 Warren Street, New York City, as successor to Curtis & Carhart, Inc., who retired from active business on May 1. The company also is establishing at 52 Warren Street, New York, a direct factory representative, Frank P. Caproni, who will take care of all direct factory business and service, particularly drum-type apparatus and special types of electric motor control equipment.

Electrical Patents

Announced by U. S. Patent Office

(Issued May 1, 1928)

1,668,197. SUSPENSION TOWER; G. R. Falkiner-Nuttall, San Francisco, Calif. App. filed June 2, 1926.

1,668,199. AUTOMATICALLY - CONTROLLED ELECTRIC HEATING SYSTEM; E. L. Fonseca, Newark, N. J. App. filed Jan. 19, 1927. Applicable to hair waving machines.

1,668,201. CURRENT-RECTIFYING UNIT AND METHOD OF PREPARING THE SAME; E. R. Gill, Sr., Yonkers, N. Y. App. filed Sept. 25, 1926.

1,668,249. AUTOMOBILE RIDING AMUSEMENT DEVICE; F. S. Rich, Los Angeles, Calif. App. filed Dec. 13, 1926.

1,668,250. ELECTRIC LAUNDRY IRON; E. J. Rohne, Minneapolis, Minn. App. filed March 23, 1926.

1,668,251. GAS-BURNER CONTROL; E. H. Ryon, Pasadena, Calif. App. filed Oct. 29, 1924.

1,668,253. SAFETY GROUNDING CONNECTION; R. A. Schmitt, San Diego, Calif. App. filed April 28, 1926.

1,668,272. SYNCHRONOUS MOTOR; V. A. Flynn, St. Louis, Mo. App. filed Aug. 2, 1926. Which possesses the mechanical features of an asynchronous motor and are adapted to carry variable load at synchronous speed.

1,668,273. SYNCHRONOUS MOTOR; V. A. Fynn, St. Louis, Mo. App. filed Aug. 11, 1926. In which a flux revolving synchronously with respect to the primary is produced at sub-synchronous speeds.

1,668,278. RECIPROCATING ELECTRIC MOTOR; J. D. Langdon, Los Angeles, Calif. App. filed Oct. 8, 1926.

1,668,285. ELECTRIC POWER - GENERATING SYSTEM; J. Pope, Brookline, Mass. App. filed Jan. 17, 1923.

1,668,293. APPARATUS FOR ELECTRICALLY TREATING LIQUIDS; F. F. Van Tuyl, Ann Arbor, Mich. App. filed Oct. 1, 1925.

1,668,310. LIGHTNING ARRESTER; G. R. Folds, Evanston, Ill. App. filed May 28, 1923. For low voltage electric circuits, such as telephone, telegraph and signal systems.

1,668,343. SIGNAL; W. Sparks, Jackson, Mich. App. filed July 16, 1920. Motor driven or other type of horn.

1,668,346. SUSPENSION LINK FOR OVERHEAD CONTACT WIRES AND METHOD OF USING SAME; T. Varney, Sewickley, Pa. App. filed May 2, 1925.

1,668,365. SELF - STARTING SYNCHRONOUS MOTOR; C. I. Hall, Fort Wayne, Ind. App. filed Feb. 5, 1925. Having a disk rotor.

1,668,366. COMPENSATED ASYNCHRONOUS MACHINE; L. Hartwagner, Dresden, Germany. App. filed Aug. 9, 1923.

1,668,377. TRANSFORMER FOR ELECTRIC-ARC CUTTING AND WELDING APPARATUS; F. C. Owen, Fayetteville, N. C. App. filed Nov. 12, 1925.

1,668,381. ELECTRICAL CONNECTER; C. A. Schild, Ft. Wayne, Ind. App. filed Oct. 30, 1923.

1,668,404. SEPARATOR AND PLATE HOLDER; F. E. Hollen, Chippewa Falls, Wis. App. filed April 30, 1926.

1,668,417. HEATING APPARATUS; S. M. McConnell, Tampa, Fla. App. filed April 28, 1927. With forced air draft.

1,668,434. LIQUID-TESTING APPARATUS; E. W. Todd, Mitchell, Neb. App. filed Nov. 23, 1926. For electrically determining the hydrogen ion concentration of liquids.

1,668,450. CUT-OUT; J. M. Fried, Vicksburg, Miss. App. filed Oct. 27, 1922. With means for preventing short-circuiting or overfusing.

1,668,457. RATE-OF-FLOW INDICATOR WITH ELECTRIC INTEGRATION FOR FLUIDS AND GASES FLOWING THROUGH A VENTURI TUBE; W. Kath, Berlin-Friedenau, Germany. App. filed Aug. 24, 1921.

1,668,463. TROLLEY HEAD; C. Pandolfo, Montevideo, Uruguay. App. filed March 28, 1927.

1,668,477. HEATING ELEMENT; H. Westergaard, Solvang, Calif. App. filed Nov. 19, 1926.

1,668,513. PROTECTOR; G. A. Millward, Brownsville, Pa. App. filed June 12, 1926. For inclosing a live electric conductor wire, for the protection of workmen.

(Issued May 8, 1928)

1,668,554. ASYNCHRONOUS POLYPHASE ELECTRIC MOTOR; F. Ernstein, Roubaix, France. App. filed May 28, 1923. With means for operating it at two or more speeds.

1,668,581. ELECTRICAL INSULATING KNOB; D. McI. Brown, Prince Rupert, B. C., Canada. App. filed Sept. 24, 1925. For low-tension wiring.

1,668,587. ELECTRICAL APPARATUS; E. Dickey, Dayton, Ohio. App. filed Dec. 18, 1922. Farm-lighting unit.

1,668,605. TRIP MECHANISM FOR OIL BURNERS; C. A. Reif, Buffalo, N. Y. App. filed Sept. 24, 1926.

1,668,606. CONNECTER PLUG; T. C. Roberts, New York, N. Y. App. filed Aug. 18, 1921.

1,668,615. DEVICE FOR CONTROLLING AND ADJUSTING THE CURRENT PASSING THROUGH AN ARC FED WITH ALTERNATING CURRENT; P. M. G. Toulon, Puteaux, France. App. filed June 29, 1926.

1,668,636. DISPLAY SIGN; O. C. Duryea, Knoxville, Tenn. App. filed July 1, 1924. Designed to be illuminated intermittently by the movement of a door.

1,668,654. DIRECT-CURRENT-TRANSFORMING APPARATUS; C. R. Moore, Maplewood, N. J. App. filed March 23, 1927.

1,668,699. FLEXIBLE CONDUIT FOR ELECTRIC WIRES; F. D. Saylor, Detroit, Mich. App. filed July 20, 1925.

1,668,707. AIR-CONDITIONING HUMIDIFIER; C. J. Allen, Minneapolis, Minn. App. filed Jan. 23, 1924.

1,668,711. REGULATION OF ELECTRIC CIRCUITS; C. T. Evans, Milwaukee, Wis. App. filed Aug. 2, 1923. Intensity control of alternating current circuits for lighting as with regulators of the variable inductance type.

1,668,731. ELECTROMAGNETICALLY-OPERATED SWITCH; G. E. Perry, Chicago, Ill. App. filed July 12, 1920.

1,668,735. CIRCUIT BREAKER CONTROL; W. M. Scott, Tredyffrin Township, Chester Co., Pa. App. filed May 12, 1924.

1,668,740. BATTERY ELECTROLYTE COMPOUND; L. R. Steele, Boulder, Colo. App. filed March 2, 1922. Comprising a suspension in water of a powdered compound formed from a soluble silicate and ammonium sulphate.

1,668,741. METHOD OF MAKING STORAGE BATTERIES; L. R. Steele, Boulder, Colo. App. filed Feb. 28, 1923.

1,668,752. ELECTROMAGNET; A. E. Anderson, Milton, Mass. App. filed April 23, 1925.

1,668,783. ELECTRIC WELDING APPARATUS; W. E. Rupley, Los Angeles, Calif. App. filed April 13, 1925.

1,668,789. LIGHTING FIXTURE; W. Symmes, G. H. Harman and C. F. Duval, San Francisco, Calif. App. filed June 9, 1926.

1,668,798. ELECTRIC METER; H. R. Bartlett and H. J. Blakeslee, West Hartford, Conn. App. filed May 26, 1927. Portable rotating standard meter with means for using as a watt meter for indicating the power or load on a circuit.

1,668,801. STORAGE-BATTERY PLATE; J. H. Calbeck, Joplin, and J. A. Schaeffer, St. Louis, Mo. App. filed July 26, 1924.

1,668,828. ELECTRICAL SWITCH; A. G. Steinmayer, Chicago, Ill. App. filed Jan. 19, 1924.

1,668,831. AUTOMATIC CLAMPING CEILING FIXTURE; A. K. Sutherland, Milwaukee, Wis. App. filed July 31, 1925.

1,668,847. MEANS ADAPTING ELECTRIC FLASH LIGHTS FOR TESTING ELECTRIC CIRCUITS; L. T. Hook, Seattle, Wash. App. filed Jan. 29, 1927.

1,668,859. FURNACE-IGNITION DEVICE; D. H. McCorkle, Berkeley, Calif. App. filed June 8, 1925.

1,668,863. ELECTROLYTIC DEVICE; W. Morrison, Chicago, Ill. App. filed Sept. 15, 1924. Rectifier type.

1,668,880. DOOR OR CURTAIN OPERATING MECHANISM; E. J. Vallen, Akron, Ohio. App. filed June 3, 1927.

1,668,925. LIQUID-LEVEL INDICATOR; C. W. Schirmer, Yonkers, and H. P. Wood and DeW.D. Wood, Poughkeepsie, N. Y. App. filed Dec. 3, 1921.

1,668,929. THEATER-SEAT ANNUNCIATOR; G. W. Westervelt, Webster Groves, Mo. App. filed Jan. 14, 1926.

1,668,953. MOLDING FOR ELECTRIC CABLES; F. W. Erickson, Larchmont, N. Y. App. filed April 10, 1926.

1,668,973. THERMOSTATIC REGULATOR; A. J. Mottlau, Pittsburgh, Pa. App. filed July 11, 1924.

1,668,974. SNAP SWITCH; A. J. Mottlau, Pittsburgh, Pa. App. filed March 12, 1926.

1,669,005. HEATING ELEMENT FOR TEMPERING MACHINES; P. Hustadt and K. Hustadt, Remscheid-Hasten, Germany. App. filed April 28, 1927.

1,669,028. RADIO BATTERY CHARGER; A. Soberg, Mohall, N. D. App. filed June 11, 1926. Actuated by wind power.

1,669,038. EXTENSION-CORD CONNECTER; L. S. Brach, East Orange, N. J. App. filed Aug. 1, 1925. For use in telephone or radio work.

New Trade Literature

DIESEL-ELECTRIC DRIVE FOR MARINE EQUIPMENT. — The General Electric Company, Schenectady, N. Y., has issued bulletin GEA-867 describing and illustrating the Diesel-electric drive. The company also is distributing the following bulletins: GEA-447B, in which it gives illustrations and data on tugboats equipped with the Diesel-electric drive; GEA-868, covering Diesel-electric drive for ferryboats; GEA-870, covering Diesel-electric drive for passenger and cargo vessels and ships of special type; GEA-871, covering Diesel-electric drive for tankers; GEA-886, describing electric motor and control equipment for deck auxiliaries, and GEA-946, describing electric motor and control equipment for under deck auxiliaries.

ELECTRIC RAILWAY ACCESSORIES. —Supplement No. 1 to catalog No. 20 issued by the Ohio Brass Company, Mansfield, Ohio, describes its new electric railway devices such as clamps, bonds, headlights, frogs, etc., brought out since the issuing of its catalog No. 20.

LIGHTNING ARRESTERS.—"We Know —They Believe—Now They Know" is the title of booklet No. 252, the eighth of a series covering the technical features of the crystal valve lightning arrester as they apply to modern lightning protection and which is being issued by the Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia.

COUNTERS. — The Bristol Company, Waterbury, Conn., has issued bulletin No. 365 describing the different types of Bristol counters for use in automatic machines of all kinds as punch presses, printing presses, conveying machinery, pumps, textile machinery, etc., and wherever there are mechanical operations to be counted. It contains illustrations and also a few methods of installing the counters.

STEEL POLES.—Catalog No. 130 issued by the Truscon Steel Company, Youngstown, Ohio, describes and illustrates the Truscon copper bearing "Weltrus" steel poles. The catalog contains data and information on weight, strength, and dimensions of standard types of "Weltrus" steel poles.

CRANE.—The Whiting Corporation, Harvey, Ill., is distributing bulletin No. 185 describing its hand power crane.

AIR COMPRESSORS AND TURBINES. —The General Electric Company, Schenectady, N. Y., is distributing bulletin GEA-588A describing and illustrating its geared centrifugal air compressors. The company also has issued bulletin GEA-197A covering its type D-54 mechanical drive turbines.

FUSED SWITCHES.—A bulletin issued by the W. N. Matthews Corporation, St. Louis, covers the different types of Matthews "Fuswitches." Illustrations are given showing various installations.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Santiago, Chile (No. 31,220), for electrical appliances.

An agency is desired in Berlin, Germany (No. 31,244), for electric hand and face drying machines and household motor-driven appliances, and another (No. 31,243), for electric hair and hand driers.

An agency is desired in Vienna, Austria (No. 31,292), for electric heating and cooking apparatus and household electrical appliances.

An agency is desired in Munich, Germany (No. 31,241), for household electrical appliances, especially washing machines, resistance wire and electric refrigerators.

Purchase is desired in La Guayra, Venezuela (No. 31,285), of electric refrigerators.

Purchase is desired in Nuremberg, Germany (No. 31,286), of telephones.

Purchase is desired in Leipzig, Germany (No. 31,242), of electric washing machines.

An agency is desired in Leipzig, Germany (No. 31,245), for small electric washing machines.